APRIL, 1940

FACTORY

MANAGEMENT and MAINTENANCE

A McGRAW-HILL PUBLICATION

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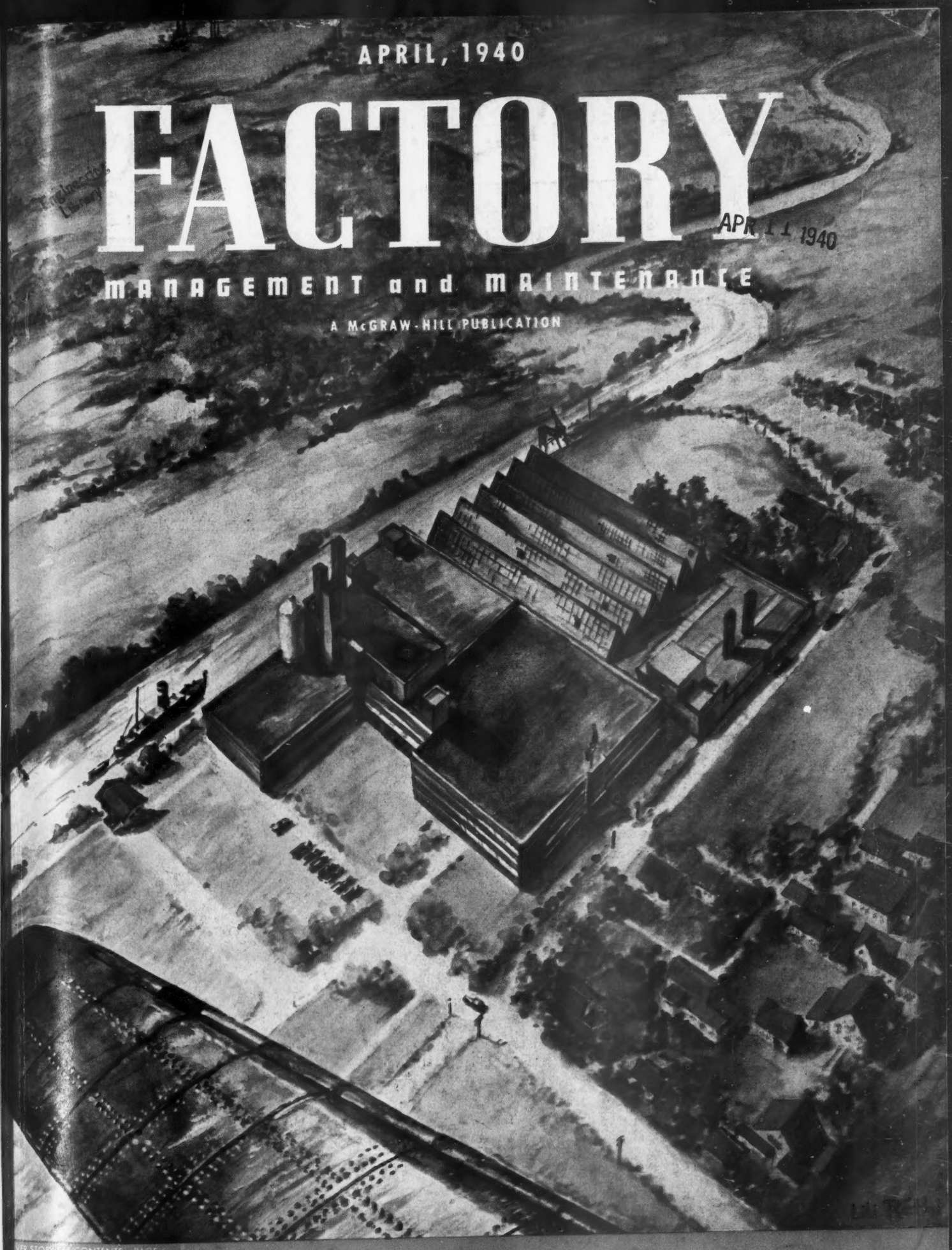

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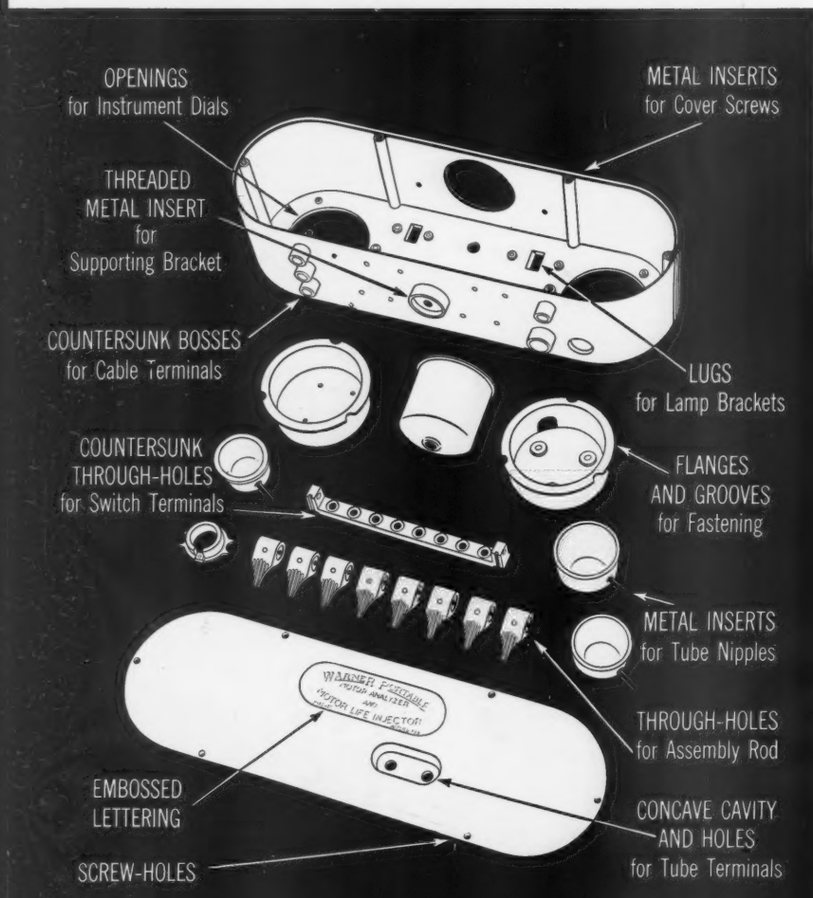
OPENINGS for Instrument Dials
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COUNTERSUNK THROUGH-HOLES for Switch Terminals
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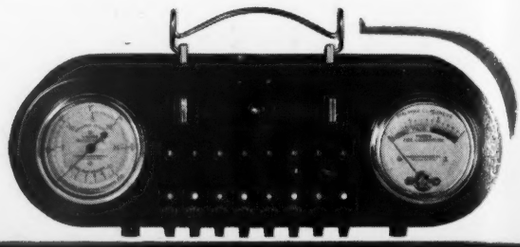

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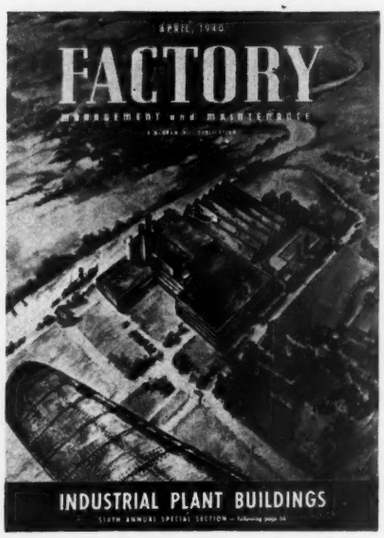

For an issue that contains a special section on "Industrial Plant Buildings," what more natural than a modern industrial plant on the cover? So we asked Lili Réthi (she did our November, 1939, cover) to do us a plant from the air. The cover sketch is her conception of a modern plant and its community set down in relatively wide-open spaces not far from an industrial city. How would you like to work in it? It's an actual plant, by the way, and an actual scene, slightly idealized.

●

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FACTORY

MANAGEMENT and MAINTENANCE

APRIL, 1940

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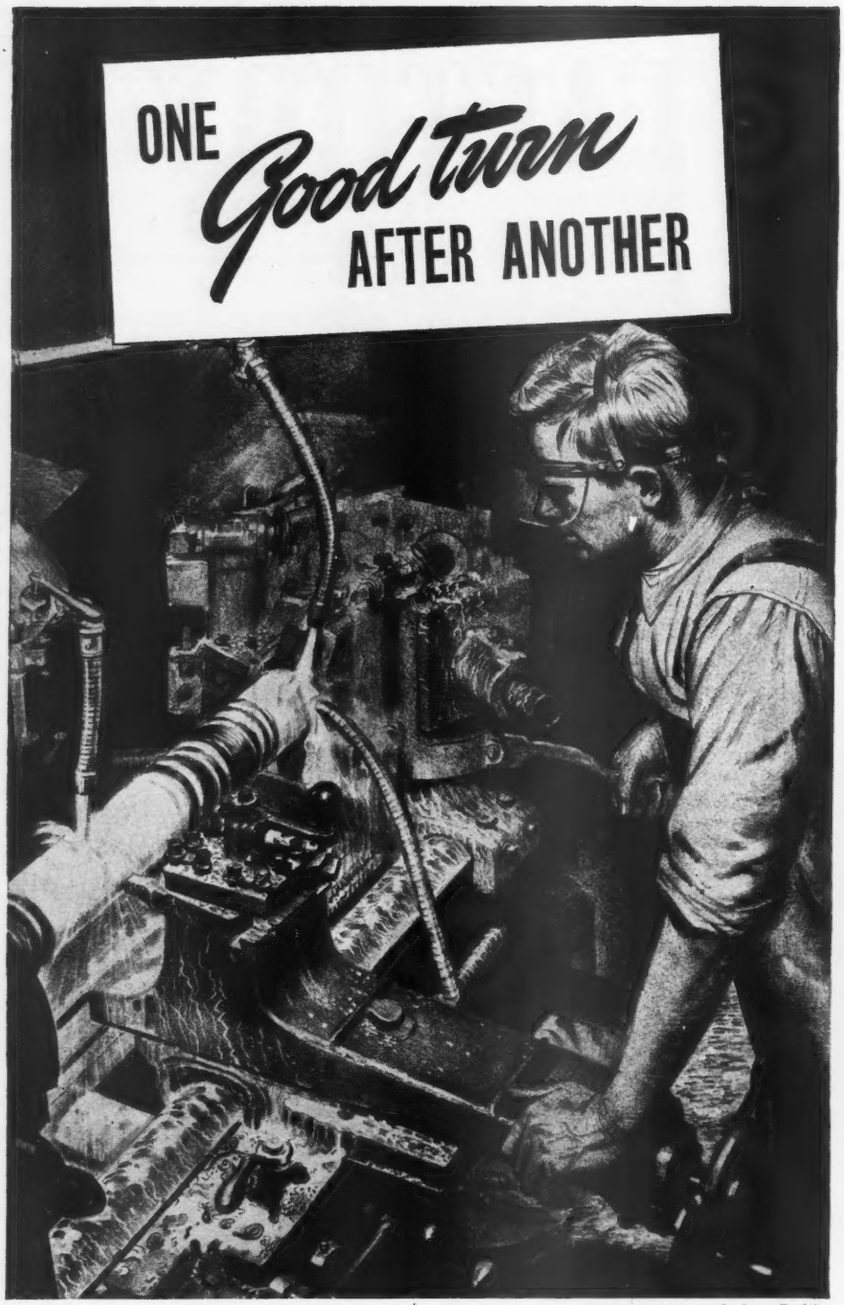

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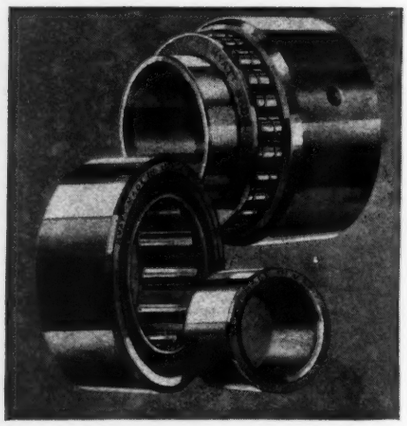

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FACTORY
MANAGEMENT and MAINTENANCE
L. C. MORROW, Editor

Invitation to a Buggy Ride

O'MAHONEY URGES Tax Cuts for Jobs—Bill Would Reward Employers for Use of Men, Penalize Stress on the Machine. This is the headline that came out of Washington recently.

Developing the headline, the New York *Times* goes on, "Senator Joseph C. O'Mahoney announced today that he would introduce a bill tomorrow (it has been introduced) designed to relieve unemployment by rewarding employers who provide jobs by giving them a credit on their tax payments."

And, further, "The purpose, he declared, was to 'balance men and machines,' by rewarding employers whose output was obtained by more than average use of man power, and by requiring a contribution from those whose production was obtained by a more than average use of machines."

This bill is dangerous in itself, because there is a possibility that it will be passed by a congress that apparently believes it can change economic law by legislation. Even the mere fact of its introduction is dangerous. Once it is reported out of committee, and gets to the stage of congressional debate, the public is going to hear again the siren voices of the ham-and-eggers, the 30-hour-weekers, the proponents of $30 every Thursday, the horse-and-buggy devotees.

The people of this fair country will be told again that our mechanization is impoverishing us, that our troubles lie in over-production, that man would have more if he created less.

Senator O'Mahoney's bill is another outcropping of the fallacious economic thinking that characterizes too many of the men at present occupying high places in Washington.

The thinking expressed in this bill is an identical twin with the thinking indicated in the President's statement, early in January, on the state of the nation. He said that "to face the task of finding jobs faster than invention can take them away—is not defeatism."

Translated literally the bill says, "Let us penalize efficiency, reward high-cost production." The result, of course, would decrease the purchasing power of existing incomes, destroy jobs, require further taxing of machines, and so repeat the cycle.

If this country wants to go back to conditions under which every man would make his living by the sweat of his brow, use of the taxing power to penalize low-cost production is a good way to start. However, it should not be overlooked that sweat itself is none too pleasant, and the living it produces is by no means good.

It seems to me we are being asked to go for a buggy ride.

L. C. Morrow

Closed Shop – the Strangler

Sam Gompers called the closed shop a way of giving the leader the right over his members of "nothing less than economic decapitation." Whiting Williams, who "gets around" among wage earners, finds it a leader, not member, issue; proposes in this article a five-point answer which wise managers will do well to adopt now

WHITING WILLIAMS
Consulting Editor

Is the world-famous efficiency of American industry to be strangled to death? Is our equally world-famous combination of the globe's highest wages with the same globe's lowest selling prices about to be murdered?

Nothing less than this is threatened by this present, paradoxical combination—that at the same time that workers are becoming more and more reluctant to pay union dues, their "leaders" are making end runs around this reluctance by obtaining more and more closed shop agreements with employers. Today this sovereign antidote for dilatory dues-payers is reported to be administered by contracts affecting a total of 3,000,000 workers! While most of these are in the powerful CIO United Mine Workers and the long-established AFL building crafts, this number shows almost daily increase as the result, chiefly, of agreements signed by smaller, less experienced employers. Disquieting as this is, it says nothing of those other thousands who work where the control of the job has, without the authority of contract but nevertheless as a matter of actual daily experience, passed out of the hands of both the worker and his employer into the hands of an irresponsible third party.

"Of course," explained several automobile workers a few weeks ago in Detroit, "this ratification meeting of our 20,000-man outfit is attended by 15 to 18,000 paid-up union members. That's because every few days for these last few months we've all seen three or four big husky leaders come up to our companions on the job, tell them they've had their last warning, and then lead 'em to the gate and tell 'em to get the hell out and never come back! And when these men—even guys with 15 or 20 years' seniority—ask the employment office to put 'em back on the job, they're likely, believe me, to get one hell of a run-around."

"How come?" these workers went on. "Why, because the management thought it'd be a good idea to get the union's good will by makin' no trouble and playin' along with 'em. And then all the company gets is this eight-weeks' slap in the face."

Under such circumstances, can any fault be found with the decision of these men that:

"Although we got no use for this

"And So I Joined the Union"

A statement by Joe Doakes

Editor's note: Joe is just somebody we made up on reading Mr. Williams's manuscript. But if Joe isn't real, the things that happen to him are. And they happen to flesh-and-blood Joes every day. They illustrate the stop-at-nothing tactics so frankly endorsed by union leaders — who sell promises of peace to employers and employees alike at the price of some form or other of the closed shop

1. "I'm Joe Doakes. I like my job"

5. "One day in the cafeteria I found a hunk of rat cheese on my plate"

union and would rather trust the company, still when it lets us loyal guys down like that, what the hell can we do but *buy* the right to keep on workin'?"

They are by no means alone. Listen to this Chicago steel worker:

"The company's posted a notice that practically gives the stewards the right to collect dues on the premises in working hours. That's almost as good as the check-off. And, say, are the boys out in my department pilin' in!"

To all those working today under such conditions must be added three other groups—those in shops where, without help of any such bulletin, union stewards regularly exert pressure for dues and membership; second, those in shops where non-unionists are likely to be required any day to pass through a crowd which jeers at non-button-wearers—when it is not kicking the said non-button-wearers' shins. And, third, those whose companions, noon after noon, put pieces of 'rat cheese' before them in the cafeteria. All three, of course, are in shops covered by agreements that solemnly prohibit all such evils as those just cited.

Nevertheless, in spite of all the foregoing, my contacts with workers convince me that the great majority of them have no wish for the closed shop—that it is decidedly a leader, not a member, issue. Insofar as members accept it without resistance, they do so only because it appears to be the only way to hold their jobs—hold them at a time when work is everywhere considered "as scarce as hen's teeth."

Job Insurance for Sale

"Outside union tell me," so a certain employee explained his perfectly understandable willingness to purchase job insurance from any and every salesman, "if pay 'em dollar, then no catch 'em lay-off. Me pay 'em dollar. Then independent union tell me if pay 'em 25 cents, no catch 'em lay-off. Me pay 'em 25 cents. *And today me catch 'em lay-off!* What da hell! What can do?"

Small wonder if such immediate and compelling pressure blinds the worker to the later, more distant, danger that his individual hold on his job will shortly pass out of his own and also his employer's hands into the hands of "leaders" he may not so much as know, much less trust.

Luckily there are many who can see farther—and do.

"These boys," said another Detroit worker recently, "may think the company's fairly tough to get along with. But wait till they have to keep up their stand-in with all their union leaders or get the hell out!"

Today the most urgent need in the whole broad expanse of American industry is that all our workers, along with all our public, be helped to understand just what closed shop means—that those who as yet have had no chance to learn its meaning by their personal experience be told of the experience of those who have so learned.

To be sure, the meaning of closed shop should be plain enough. In plain letters it spells this—that whether a man works or not will depend no longer on his ability to meet the requirements

2. "I like the company I work for, specially when payday comes round"

3. "When the union organizers came to town, no soap. I wouldn't listen"

4. "But lots of the fellers did. Soon there were no free lifts to work"

6. "Next morning as I punched in I got an accidental kick in the shins"

7. "On the way home that night a big guy took a healthy poke at me"

8. "Well, it looked like safety first to join up. So I did. Wouldn't you?"

of his employer, but instead upon his ability to satisfy every slightest whim of his union leader. It means that the worker abandons all the protection against injustice at the hands of a chartered employer whose responsibilities to his employees have been legally defined in dozens of specific ways—with all sorts of courts standing ready, open, and glad to correct abuse and to furnish redress. It means, instead, that the worker daily submits himself and his job to the complete say-so of the heads of organizations in which he seldom enjoys the right of a *bona fide* secret ballot; which are mostly unchartered and which are under no responsibility to government or anybody whatsoever; whose dealings, fair or unfair, are subject to the control of no court whatever.

The Union Wins

Bad as this contrast has always been, it has been made vastly worse by federal laws which in the past few years have greatly increased both management's responsibilities to its employees and also the rights of labor unions at the same time that they have added not one iota to the worker's rights as against these unions and their officers. The Wagner Act, according to careful lawyers, confers upon the worker the right to join a union and then proceeds to give all other rights not to him but to the union!

To be sure, it would seem that workers generally would learn to fear the closed shop by merely observing how it has year after year raised costs and thereby lessened the yearly total of work in the closed-shop building trades and closed-shop, check-off coal mines.

But workers seldom "get" the full meaning of such generalized, such diluted, demonstrations. That is partly, no doubt, because such industry-wide and such years-long demonstrations can too easily be explained away by the specious arguments of partisans. But mainly it is because the average worker waits to learn about such things through his own personal experience or by the personal experience of his friends and acquaintances. It is because so many of them, especially in such newly organized areas as steel, automobiles, and rubber, have not yet *experienced* the closed shop that they so generally fail to make any sort of resistance while their alleged leaders bend all their efforts to secure the closed, the "union," the "preferential," the "harmony" agreement, the "hiring hall" or some related method of *forcing their employer to force his workers* to wear the union's bridle.

But the workers are not the only ones whose lack of personal experience makes them victims of the closed shop juggernaut. Much the same can be said of employers! In fact, present union strategy makes it look as though the leaders have lately found it easier to fool, bluff and intimidate Mr. Manager than Mr. Worker.

"We're causing," so the leaders in a certain industry frankly explain the strategy behind their sit-downs, slow-downs, and what not, "all the trouble and all the interruptions we possibly can—until some day management decides to buy from us our promise of peace and continuous operation at the price of some form or other of the closed shop!"

Such a purchase is all too likely to look attractive to a harassed manager. Especially when he has had too little experience to understand just why most leaders stand more than willing to pay for the closed shop's control over their members' jobs, and thus their dues, almost any price imaginable—wage-cuts for their members, price connivance against their customers, anything and everything. Especially also if Mr. Employer forgets the great gap that separates his skilled men from his unskilled and therefore fails to appreciate how shocked and grieved *he* would be if, as a loyal, honest, skilled American, he were thus forced by his employer to accept the control of his career by unskilled laborers whom he had always considered his inferiors, and whose honesty and Americanism he had all too often learned to doubt.

If They Could Listen

Altogether it is too bad that employers who are asked to take over the job of coercing their workers to do their "leaders' " will, could not first listen to such various testimonies as these:

1. "Yes, our boss had tears in his eyes when he told us he simply *had* to fire us. You see, he had finally accepted the closed-shop demand of a bunch of outsiders—plain racketeers. He hadn't suspected what it meant. But when all of us who had taken no part in either the new union or its strike—all of us who had been longest with him, had the most skilled and most responsible jobs and were the most loyal to him—when we went to join up and pay our dues, in order to hold our jobs, see?—the leaders *refused to take us in.* Said our money was no good. So he had no choice but to tell us that we were through."

2. "Sure, I'm a first-class carpenter—and would like nothing in God's world better than to work at it. But will you tell me how I can do that until

I can manage to cough up all the big money demanded in this closed-shop town before I can pick up a saw?"

3. "Sure I could sue the union. But have you ever noticed how that only makes the union's lawyer ask for a postponement—to give the union time to fire me so he can claim I'm not a member and therefore have no rights in the case? In this closed-shop town you either join or starve—or leave town!"

4. "Plenty of us know about cases where our business agent has refused jobs to us members while he gave 'em to non-members—at a big fee per day which he stuck in his own pocket. But if we raise a kick about it in union meeting we only run the chance of getting our membership—and our chance at any job at all—taken away from us on false charges and a phony vote."

5. "Especially when the treasury's low, you're likely to be assessed a heavy fine for this or that—and you gotta pay it or have your card—and your job—taken away from you."

All this means, of course, that the goodness or badness of the closed shop depends entirely upon the squareness, the moral character, of the leader. In the same way, the goodness or badness of the worker's job long depended upon the squareness of his employer. The

Strike for a closed shop was at the bottom of this ruckus in New York City. The police made a number of arrests following what they charged to be uncontrolled mass picketing

difference today is that while government has lately set up all sorts of restrictions upon the employer's liberty to inflict injustice, along with various means of redress in case of injustice, it has set up no scintilla of restriction upon, or protection against, the union head.

It might at first glance appear, accordingly, that as rapidly as the closed shop becomes general, workers will force their legislators to establish the needed protections. But the trouble is that in the nature of the case these workers must always approach their legislators as unorganized individuals —likely therefore to secure scant attention in competition with entrenched leaders who claim to speak for "all the thousands of our members."

So it is far from safe for Mr. Employer to wait for help from Mr. Legislator—also from a revised Wagner Act or a renovated NLRB.

So, too, it would appear costly to wait for the time when closed-shop leaders, freed as they are from the need of further serving their now helpless members, get so far out of touch with them that the organization becomes innocuous, ready to blow up under the impact of some sudden crisis. (This would appear to threaten a certain Mid-Western city's taxi-teamsters' union in which "the check-off has taken a buck from us every fortnight for several years. We've never had a meeting and it's unhealthy to ask what becomes of our $2,000 per month.") Exactly this danger is said to be a chief reason why the British labor leaders have long agreed with British legislators in opposing the whole idea—also, why old Sam Gompers called the closed shop a way of giving the leader the right over his members of "nothing less than *economic decapitation*."

A Program for Now

Unfortunately, waiting for either of these developments is likely to bring lessened efficiency, higher costs, and smaller markets, and thus put both worker and manager off the job. Instead, therefore, it would appear urgent that the wise manager plan to adopt *now* some such program as this:

1. Insist upon both the letter and the spirit of whatever union contract he has signed—punish infractions of its clauses against intimidation, dues collection, or membership solicitation upon company property or during working hours.

2. Reduce to a minimum the need of the "steward's" services by training plant foremen in the handling of workers, by insisting that these foremen above all else show themselves "straight-shooters," and by taking these foremen into his full confidence as to the problems of the business.

3. Make sure that his foremen and also his skilled workers enjoy today something like the same differentials as compared with unskilled workers that they did before these unskilled workers received their various recent boosts. (Such differentials include not only cents per hour or dollars per year but also a variety of less tangible status-giving perquisites.)

4. Maintain and increase his own personal contacts, along with those of all his associated officers and supervisors, with every possible member of his working force. Remember, in spite of all the recent fuss and uproar, his every employee remains an individual, not a member of any "class"—a chap who lies awake nights worrying about his individual fears, hopes, and prides; that as far as this individual has voluntarily accepted the leadership of persons unfriendly to the company, he has done so because he believes these leaders understand his worrisome fears, hopes, and prides better than the company does; that the only way the company can equal that understanding is by closer, sincerer contact with its every individual worrier.

5. Send, the moment any form of closed shop is demanded or even mentioned, to all his workers at their homes, a full explanation of his unwillingness to grant it until he can be sure that they all understand exactly how fully it takes away from him, as a responsible person under the control of law, the further control of their daily jobs and gives it to persons who stand entirely free from all responsibility and all legal or other restrictions.

[In recommendation 5 Mr. Williams is apparently proposing that the employer face the issue, even to the point of doing battle with the Labor Board. It is obvious that some unions seeking the closed shop would cite his communication to employees as a form of coercion or undue influence. He might have suggested, as a substitute, insistence by the employer on a mass meeting of employees at which he would tell why he is opposed to granting the closed shop. Only advantage of a communication sent to workers' homes is, wives get a first-hand statement.—EDITOR.]

The ABC of the Variable Budget

A. A. MERRILL

Industrial Department, General Electric Company, Schenectady, N. Y.

Here, for quicker understanding of the principles of variable budgeting and the uses of the profitgraph, is their story in "pictures." They're good tools. Try 'em

FIGURE 1. Put down that spade! Go get the electric power shovel! In the field of figures, there is a tool that may be classed with the latter. Its popularity is growing day by day. The figure shows its simplicity. Vertical scale is *dollars expense;* horizontal scale is *plant production.*

If output increases, total expense rises. The curve generally approximates a straight line.

If we can budget volume, we can estimate the corresponding expense by reading the dollars from this curve. That is where we get the name "variable budget." If an expense budget is based on this expense curve, it is not static and incapable of change. Rather, it is flexible and may be adjusted to recognize the effect of *production volume* on *expense.*

FIGURE 2. Here we have divided total expense in two parts, *fixed expense* and *variable expense.* The line dividing the two parts has been drawn parallel to the *total expense* line. Because it is parallel, the distance between the two lines is constant and represents that part of the expenses that does not vary with volume.

Consider the left end of the chart. Here variable expense is zero, output is zero, and fixed expense equals total expense. Fixed expense then includes such items as certain taxes, depreciation, base salaries of a skeleton force, base rental (after the landlord has reduced the rent because of hard times), maintenance of machinery, salaries of watchmen. These expenses go on irrespective of volume.

It should be noted that this expense is fixed in total dollars only. Expressed as dollars per unit, the so-called fixed expense varies considerably. If it is spread over only a few units, cost per unit is high; if over a large quantity, cost per unit becomes quite low—the familiar effect of mass production. However, total dollars are fixed, so this part of the expense is called fixed.

The remaining expense lying below the dividing line is called the variable expense, and includes elements that tend to increase in direct proportion to number of units produced—raises in pay given to the skeleton force to compensate them for increased hours of labor, salaries of men added to payroll to carry increased production, increases in power consumed, material used, traveling and entertaining expense, raises in rent brought about by good times.

Again it should be noted that this element of cost is variable in total dollars only. Considered as cost per unit, the variable cost becomes a fixed number of dollars per unit. In fact, it is usually measured as so many dollars per unit, or so much per cent of dollars of sales. However, because it varies in total dollars, it is called variable expense.

FIGURE 3. With a fixed price in dollars per unit, total sales dollars increase in proportion to number of items sold. This sales line intersects the total expense line at a point called the break-even point. To the left of this point, sales dollars do not cover expenses; losses accrue. To the right, (higher production), total sales dollars are larger than total expenses, the difference being profits.

Thus, if we can estimate volume of production, we can estimate, by using this chart, the amount of profits or losses to be expected.

FIGURE 4. If desired, the chart may be drawn to show the breakdown of the expense into its components.

In this example there are two main parts, *production expense* and *commercial and administrative expense.* A line (*AB*) is drawn to show the division between these two groups.

Each of these two divisions may be broken down into the fixed and variable expense components, by drawing lines (*AC* and *DE*), each parallel to the expense line just above.

Above the total expense line, lines may be drawn to show expense plus preferred dividends, common dividends, etc. The volume of production that will yield enough profits to cover these dividends may then be read from the curve, at the break-even points.

Figure 1

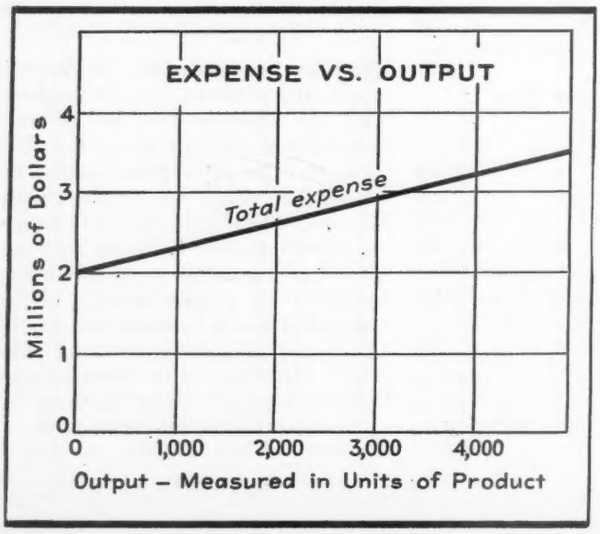
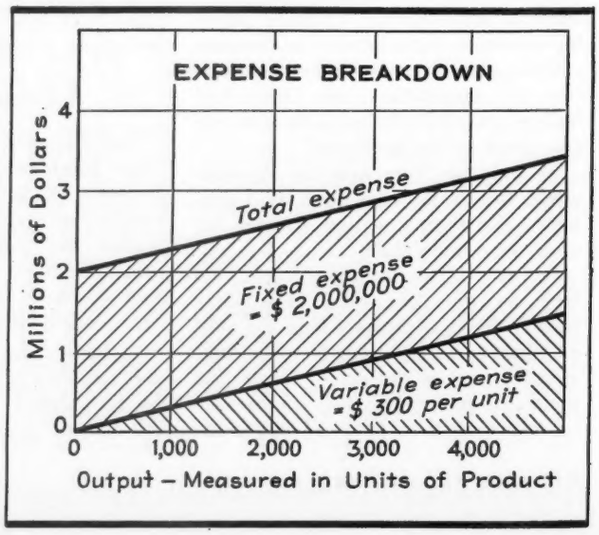


Figure 2



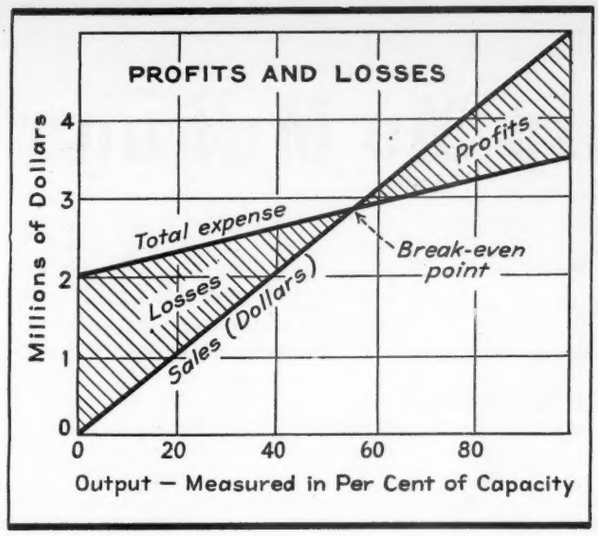


Figure 3

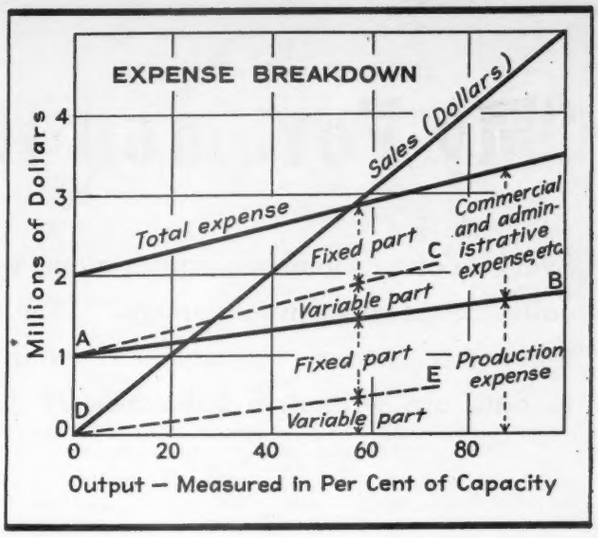


Figure 4

FIGURE 5. If prices are changed, the sales dollars line is raised or lowered. An increase in prices moves the break-even point to the left; a decrease moves it to the right.

FIGURE 6. In a year of poor production, overhead cost per unit is high; in good years cost per unit is relatively low. This is just the opposite from the necessary changes in price, which may be lowered to sell in poor times.

These opposing changes may be alleviated somewhat by accumulating the overhead expenses in an account, and liquidating or absorbing them by charging a constant amount off to each unit of product. The amount liquidated in poor years will not be enough to cover accumulating expenses, and the balance in the overhead account increases. In good years the amount liquidated exceeds actual expenses, and the amount in the account decreases. The amount charged to each unit of product should be carefully chosen so that the account will balance out over a period of years.

This method of liquidating overhead expense is illustrated here. The expense liquidations vary directly with output, being equal to a constant number of dollars per unit. The slope of the line depends on amount charged per unit, being steeper if the chosen rate is higher. It crosses the actual expense line at the point where actual expenses accruing are balanced by charges to product. To the left of this point expenses exceed liquidations, and the debit balance in the expense account increases. To the right, liquidations exceed actual expenses, and the debit balance in the account is reduced, or turned into a credit.

The liquidating rate is sometimes called expense allowance. It should be noted that it is natural to expect over-liquidation of this allowance in good years and under-liquidation in poor years. This is inherent. No condemnation should be expected in poor years for under-liquidation, no praise in good years for over-liquidations.

However, suppose that an actual expense line has been established by past performance (see Figure 4 again). If an actual expense point falls above this line, the reason should be investigated. Also, if an organization can operate at a point below this line, the increase in efficiency should be recognized.

CONCLUSION: Nothing remains except to chart your own business. There are two methods. Either may be used. If the second is selected, it may be checked by the first.

Method 1. From your company records take expense figures for certain periods of time (months or years) and plot against corresponding figures for production output. (Dollars sales figures may be the easiest measure of output. If prices have not changed, dollars sales should be a good measure of production). This will result in a number of points on your chart. Then draw a line through these points, or as close to them as possible.

Method 2. From your cost records, select those costs that are fixed, and estimate the fixed part of costs that are partly fixed and partly variable. Add all fixed items together. This will give you the intersection point at the left edge of the chart, where total cost equals fixed cost. Then, for any rate of production you choose, calculate total fixed plus variable cost. This will give another point. Connect the two points and you have the expense line.

Figure 5

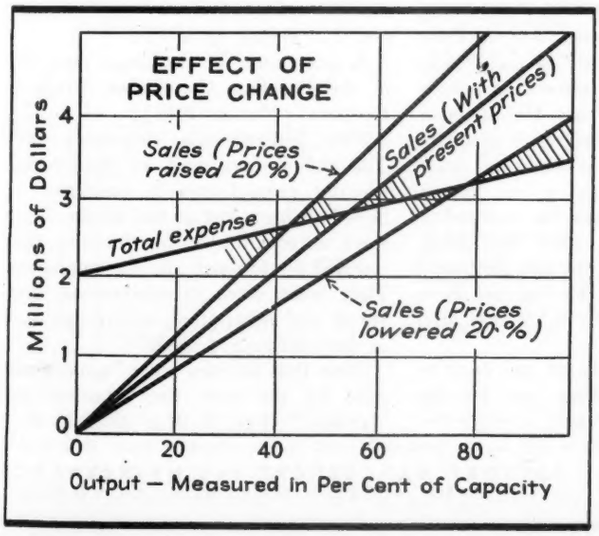
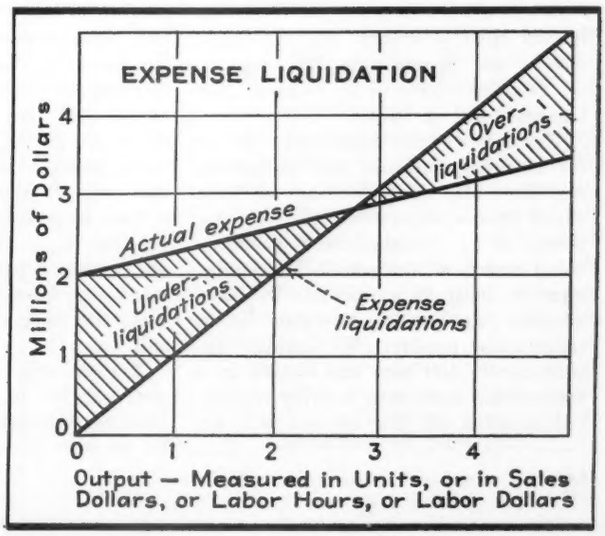

EFFECT OF PRICE CHANGE
Millions of Dollars
Sales (Prices raised 20%)
Sales (With present prices)
Total expense
Sales (Prices lowered 20%)
Output — Measured in Per Cent of Capacity

Figure 6



"My Foremen Help Me Manage"

Every so often somebody comes along with something he calls "cooperative management." Well, if there's such a thing, this "factory management council" is it. Results to date are written in thousands of dollars of savings

F. W. STEIN
Works Manager
The Standard Register Company
Dayton

Bill Stein's management council meets in the company assembly hall. This is not the kind of meeting where the manager does the talking and the foremen are so many ventriloquist's dummies. Stein stands on the shore, lets the foremen steer their own boat

TWO YEARS AGO we began an experiment in cooperative management. It has worked remarkably well—so well, indeed, that it seems to me others might take our simple plan and adapt it to their own operating problems.

But first a word about our business. It was aptly described just the other day by one of our men. He said:

"You don't have to be crazy in this business. But it helps."

We manufacture continuous forms for business machines and autograph registers—also the feeding devices, check signers, separators, etc., for these forms. It is a complicated business. Great accuracy is required. The equipment is, most of it, special. We have adapted straight-line methods to a tailor-made product. We employ approximately 600 men and women in a factory that is modern in every respect.

I mention all this so you will see that our business is not "different." Like yours, it is full of problems that have to be solved.

Now of late years people have been blaming the foreman for most of management's troubles. He has been so often referred to as the "key man," the link between management and workers. He has been made to go to weekly meetings where more often than not he caught hell from his boss. He has been given the job of interpreting management policies without knowing what they are all about, much less having a voice in making them. He has known precious little about what was going on in other departments, and he hasn't much cared because he has not been given the chance really to express himself.

Yet we write glibly of the need to put policies in writing and let the foreman interpret them!

If you as the operating head of a business think you can sit in an office and issue rules and regulations, or draw up policies, no matter how simple, and then have them put into effect intelligently and with the wholehearted cooperation of your foremen, you are riding to a fall.

A year ago, W. H. Lowe, president of the Paraffine Companies, wrote in FACTORY (March, 1939):

"We learned one surprising fact. The policies we had so fondly and proudly promulgated in executive offices had been lost in the shuffle. They were unrecognizable by the time they reached the foremen and the employees. They were often misunderstood, confused, and misapplied, or through lack of knowledge not used."

Note that policies were "unrecognizable by the time they reached the foremen." How, if it is difficult, even

impossible, to interpret policies to foremen, can they in turn hope to do any kind of job of interpreting those policies to their men?

That, it seems to me, is a poser. I do not mean to say that putting policies in writing is not a good thing. But I do believe that such policies must necessarily be general in scope. Their interpretation is left to the foremen and supervisors.

As a result, company policies must be made, or at least defined and interpreted, almost daily. And the foreman must have a hand in their making if you want them to be properly interpreted and applied.

All of which, drawn right out of our own experience, made us realize that an entirely new approach to the problem of managing the plant was necessary. The formation of our factory management council was the result.

Briefly, the factory management council is a plan to manage more cooperatively. It provides an avenue for frank discussion of our business position, relations with customers, improvement of product, the delivery situation, costs and prices, relations with employees, and so on down the gamut of problems that beset those whose job it is to manage a business enterprise.

Included in the council are all our factory department heads, the chief engineer, the chief chemist. And we nearly always have as visitors a number of office department heads.

As works manager I am chairman and our general superintendent is vice chairman. We have a secretary. The tables are covered with paper so anyone can doodle to his heart's content.

There is an old Dutch proverb that says "the best pilots stand on the shore." I want right here to emphasize that that is what the works manager does in this set-up. I am pretty bitter about the usual type of foremen's meetings where the works manager does all the talking and where the foremen and supervisors are just so many ventriloquist's dummies.

No, I stand on the shore and let the foremen steer their own boat. I'm simply the moderator at town meeting. Problems are presented to the council by any of the members. Discussion is full and frank. If many details are involved in a particular problem, a committee is appointed to get the facts and report back to the council. Each member gets a copy of the report, and the chairman of the committee appears before the council to discuss his committee's findings and recommendations.

Someone is sure to rise at this point and question our use of the committee system. Let me say that it has resulted in facts and details that we would not ordinarily get. Committee members know they must come back armed with the facts because the other members of the council are sure to pick the report to pieces.

Some of our committees — educational, waste campaign, boxing methods and specifications, waste paper,

(*Continued on page* 100)

Bill Stein looks like a youngster. But he's an oldster in industrial experience. This is his thirtieth year in industry. He had to go to work when he was fourteen, but he has never quit going to school. At 22 he was chief engineer of a large special tool and machine company, spent four years with Nash, eleven at Fairbanks-Morse, in various capacities. Joined Standard Register not quite six years ago. Hobbies? He's an inveterate reader. Says it takes a lot of reading to keep posted

✦

STANDARD PRACTICE INSTRUCTION

SUBJECT		CLASSIFICATION	50.0001
NON-PRODUCTIVE ORDERS		SHEET NO.	1
		DATE	3-27-39
		SUPERSEDES	
		WRITTEN BY	Council
Factory General	DEPARTMENT	APPROVED BY	Committee

0.1 PURPOSE

0.11 The purpose of the Non-Productive Work Order is to authorize (after proper approval) a department to do a particular and specific non-productive job.

0.2 FORM

0.21 This order is known as "Non-Productive Work Order" (commonly called N-Order), Form 2B, and consists of 5 copies, consecutively numbered. These consecutive numbers will be the order numbers and are prefixed by "N". The last, or #5 copy, is of manilla paper. The copies are titled and collated in the following order:

#1 Copy - Cost Department
#2 Copy - Issuing Department
#3 Copy - Budget Department
#4 Copy - Work Copy (follow-up)
#5 Copy - Work Copy

0.22 This form was revised and became effective July 5, 1938. Registers containing these forms are located in six departments: Machine Shop, Composing, Press Room, Collating, Superintendent's Office and Maintenance.

0.3 USE OF COPIES

0.31 #1 - Cost Department Copy - Must be sent to the Cost Department and will be used by them to ascertain cost when job is completed. All job tickets and requisitions pertaining to "N" orders will be accumulated by them and filed by order number.

0.32 #2 - Issuing Dept. Copy - To be retained by the department issuing the order and will be used by them as a follow-up copy.

0.33 #3 - Budget Copy - Must be sent to the Factory Budget office and is used by this department for control purposes.

0.34 #4 - Work Copy (white) - Must go with the manilla copy to the department executing the order and will be used by that department head as a follow-up on the workman doing the work.

THE STANDARD REGISTER CO.

FORM NO. S-15

Final step, after a problem has been threshed out in the council, is to issue an SPI

Inspectors Are Born That Way

CHARLES A. DRAKE

Consulting Industrial Psychologist
Director, Bureau of Instructional Research
West Virginia University

Part 1. No perception, no inspection—is essentially the conclusion to be drawn from this study of what it takes to make a good inspector. The tests are designed for the easy and early identification of persons with the basic abilities required by most inspection jobs

UNTIL TWO YEARS AGO I believed, in common with most engineers and psychologists, that any person of suitable temperament, average intelligence, and normal vision could be trained to be a good inspector. Our research on industrial inspection since that time has proved the belief to be utterly mistaken. Good vision, or even superior vision, is no guarantee of inspection ability. And intelligence as measured by tests, or as reflected in school achievement, is utterly unrelated to the ability called for on most visual inspection work in industry.

It's Perception

What is this basic ability? It is usually called *perception* and is defined as the first or immediate response to a sensation of taste, smell, hearing, sight, touch, and possibly several other sensations such as weight, strain, position, and fatigue. Thus, to taste a liquid and identify it as orange juice is an act of perception. Similarly, to see an object and identify it as like or different from something else (as standard or off-standard) is an act of perception.

We have long recognized that tea-tasters and wine-tasters, as well as perfume-smellers and cheese-smellers, were doing a job of inspection based upon some ability to perceive small differences in tastes and odors. But we have been somewhat uncertain as to whether the abilities called for were innate and inherited or only the result of rigorous training and experience.

We have also observed that these professions tend to run in families and to be passed on from generation to generation, but have not ascribed the fact, usually, to inherited special aptitudes. However, our research on measures of visual perception has shown this ability or its lack to be possessed in about equal degree by twins, in lower-degree by siblings (brothers and sisters). The ability measured is also highly stable and little affected either by training or experience.

This last observation is of the utmost significance for industry. If adequate quality control of product was maintained during the period through which inspectors are selected and trained and the whole process subjected to a searching cost analysis, the results would be startling. No further argument would be needed to support the proposition that *no person should be selected as inspector, or trained for inspection, who has not shown by suitable tests that he possesses the basic abilities required.*

Our early conclusions were that only

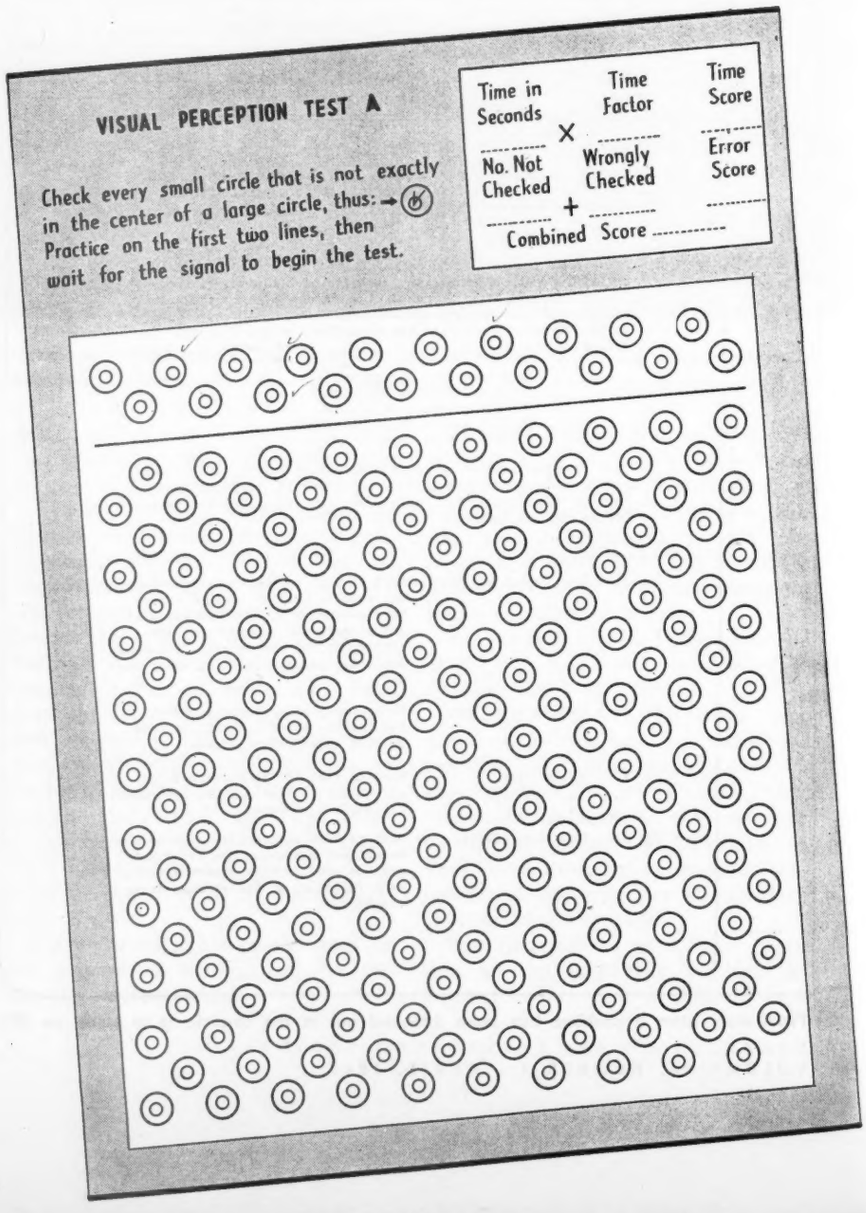
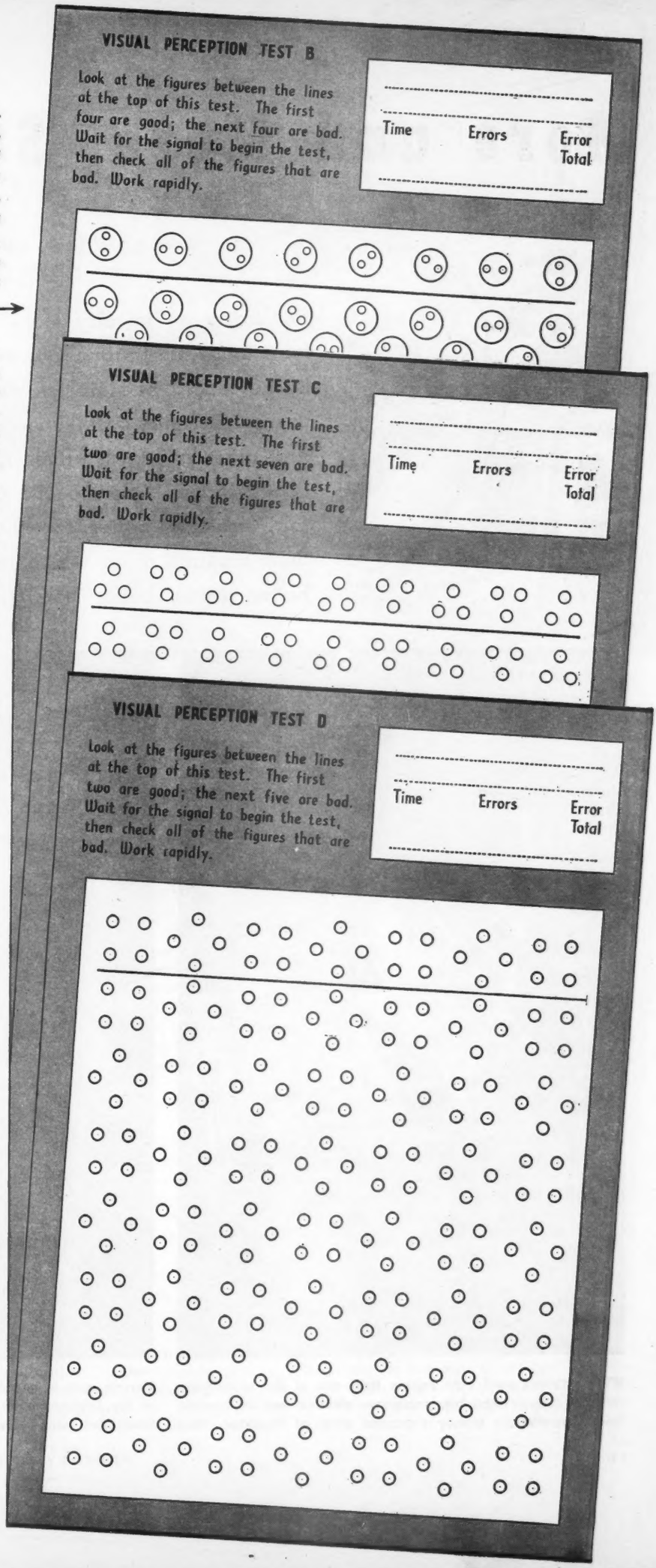

VISUAL PERCEPTION TEST A
Check every small circle that is not exactly in the center of a large circle, thus: →
Practice on the first two lines, then wait for the signal to begin the test.
Time in Seconds
Time Factor
Time Score
No. Not Checked
Wrongly Checked
Error Score
Combined Score

Figure 1. This test has only one element standard or off-standard, and whole unit is isolated by a ring. Each of the four tests begins with easy items that almost anyone can mark correctly, but ends with items so difficult that few persons can do more than guess at classifications

Figure 2 (top). Either or both of two elements in the unit may be off-standard, but the unit is still isolated by a ring

Figure 3. Test C increases the number of elements to three, and the confusion element is introduced by removing the ring

Figure 4. Test D adds a fourth element, and increases the confusion by arranging items in close proximity to one another


VISUAL PERCEPTION TEST B
Look at the figures between the lines at the top of this test. The first four are good; the next four are bad. Wait for the signal to begin the test, then check all of the figures that are bad. Work rapidly.
Time
Errors
Error Total
VISUAL PERCEPTION TEST C
Look at the figures between the lines at the top of this test. The first two are good; the next seven are bad. Wait for the signal to begin the test, then check all of the figures that are bad. Work rapidly.
Time
Errors
Error Total
VISUAL PERCEPTION TEST D
Look at the figures between the lines at the top of this test. The first two are good; the next five are bad. Wait for the signal to begin the test, then check all of the figures that are bad. Work rapidly.
Time
Errors
Error Total

15 persons among 100 applicants possessed the degree of perceptual ability called for on some relatively simple jobs involving inspection in two dimensions. We were astonished to find inspectors with serious defects of vision doing acceptable work, according to the foremen, but almost equally astonished to find that these inspectors took on the average 56 per cent more time to do the same amount of work as those with normal vision. Our later research indicates that for many inspection jobs fewer than 15 per cent of the applicants can qualify. It also indicates that only certain defects of vision are significantly related to the quality and quantity of the work done.

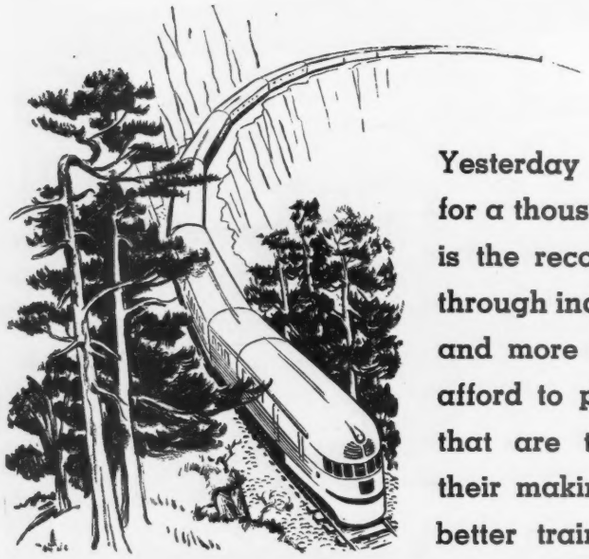
In one job studied the inspector was called upon to inspect more than 300,000 units of the product for 13 different possible defects in an 8-hour day! The task was not humanly possible, for several reasons. An 8-hour day contains 28,800 seconds. This means that inspection was at the rate of more than 10 units per second! Since this job also involved handling the product in bundles of 150 to 200 with the two hands, the effective inspection time was still further reduced. The statistical probability of getting all the units to the surface of the bunch, as they are poured from one hand to the other and back, is negligible, so that some units are never seen at all at such a rate. Rejections ran as high as 4 per cent, and of course included many units that should not have been rejected but were accidentally pulled out.

Basic in All Inspection

Our early tests of visual inspection ability involved only the discrimination of small differences in items or units when viewed one at a time. The ability to do this is certainly basic in all inspection. But from the description of the task in the foregoing paragraph it will be apparent that the inspectors were called upon to exercise another ability, that of bringing each unit visually out of the confusing background of other similar units. If each unit were separated mechanically from

(Continued on page 102)

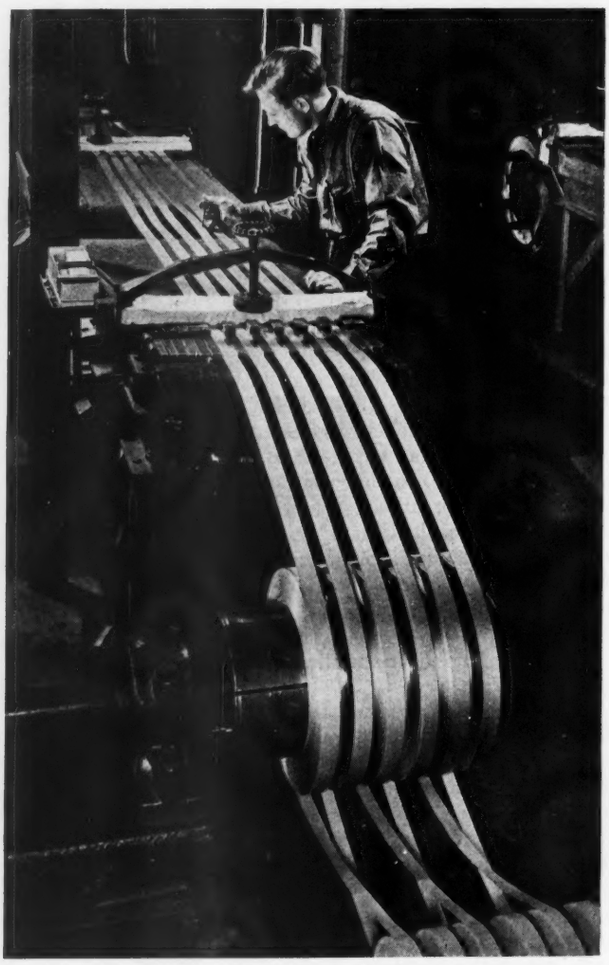
More and More "Stainless"



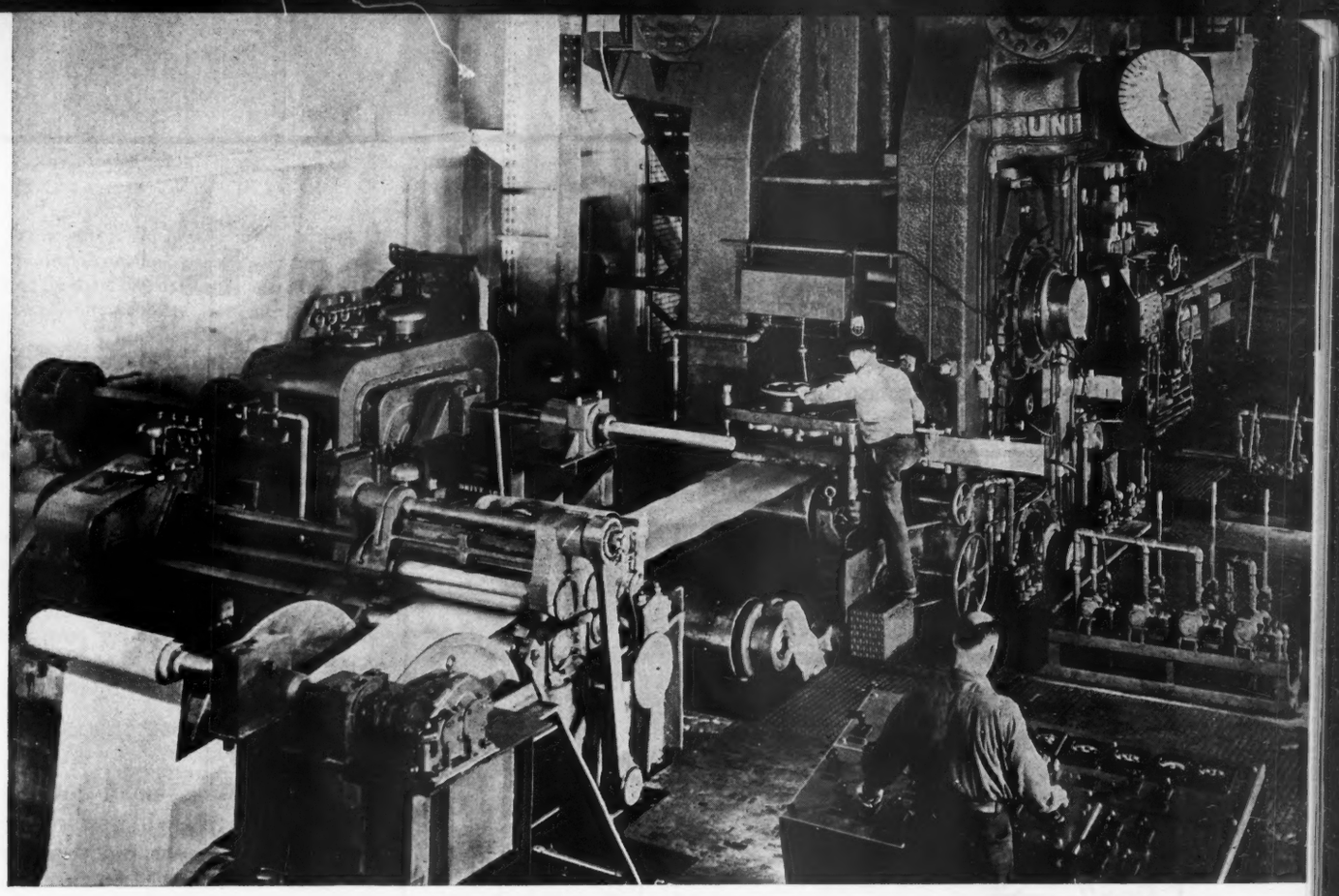
LEWIS K. URQUHART
Associate Editor

Yesterday a "jewelry store" item. Today first choice for a thousand producer and consumer goods uses. That is the record of stainless steel, made what it is today through industry's well-known faculty for producing more and more goods at prices more and more people can afford to pay. So—to cite only a handful of products that are the better for the stainless that goes into their making, or in which they are made—better cars, better trains, better pots and pans, better ice cream

Wide stainless steel strip passes from one of the normalizing furnaces (upper right) into continuous pickling unit at Republic Steel Corporation's greatly expanded plant at Massillon, Ohio



Narrow strip is gaged on the move as it passes this inspector at the finishing plant. Paper from the coils at lower right is inter-rolled with steel to protect highly polished surfaces



Cold-rolling stainless steel on 34-in. reversing mill included in new equipment put into operation by Republic Steel Corporation

STARTING AT SCRATCH less than 20 years ago, stainless steel production exceeded 85,000 tons in 1938, showed a big increase last year (figures not yet ready), may reasonably be expected to go on to a new high in 1940.

"Stainless," to keep the record straight, is the general term for steels containing high percentages of chromium and chromuim with nickel, as well as such other alloying elements as titanium, columbium, and molybdenum. The chromium ranges from 10 to 30 per cent, nickel from 2 to 36, depending upon type and intended application.

One might cite a baker's dozen of good reasons for the ascending curve mentioned in the opening paragraph. The first twelve would be the exceptional properties with which stainless steels are endowed.

For instance, they (1) have a high luster; (2) resist tarnish, rust, corrosion, and high temperatures; (3) are not affected by acids from food, fruit, vegetables, meat, or dairy products. And they can be (4) welded, (5) deep-drawn, (6) stamped, (7) formed, (8) machined to close limits, (9) forged, (10) spun, (11) rolled, (12) colored.

Thirteenth good reason for stainless steel's growing popularity is the industry's ability to meet increasing demands with better and better steels for a widening range of uses—at lower and lower prices. It is similar ability on the part of industry as a whole that has enabled the American people to enjoy an ever-higher standard of living.

Cars, for example, are better today for the stainless steel that goes into their making. Biggest use for stainless, by the way, is automobile trim. Probably one-third of all stainless now being produced goes into radiator grilles, hub caps, molding, gas tank caps, and miscellaneous auto hardware. Hundreds of tons of stainless steel are used in steering wheel spokes alone.

But other industries are moving to the fore as important users. Chief of these is the railroad industry with its high-tensile, high-speed, streamlined trains. Weight on some of these trains has been reduced by as much as 40 per cent. That means big savings!

Meat Hooks, Dough Mixers

Another important consumer is the food processing industry, where stainless steel is used for such things as meat hooks, dough mixers, milk pasteurizers, and equipment used in processing salad dressings, ice cream, cheese, and preserves.

Stainless is also being used in many another processing industry where no chemical contamination can be tolerated—for example, in the manufacture of pharmaceuticals, dyes, explosives, leather, lacquer, liquor, paper, petroleum products, rubber goods, soap, textiles, tobacco.

Add architectural applications. Add conveyors and other plant equipment, store counters, bars, and fountains.

Add stainless steel pots and pans and cooking utensils of every kind, heretofore a luxury for the privileged few. Stainless is here crashing a mass market.

The recital of the uses of stainless steel could go on and on. Only enough of them have been cited here to illustrate its possibilities—and to point out again that, as industry makes more and more of the good things of life at prices more and more people can pay, so do the people of America move on to new levels of living.

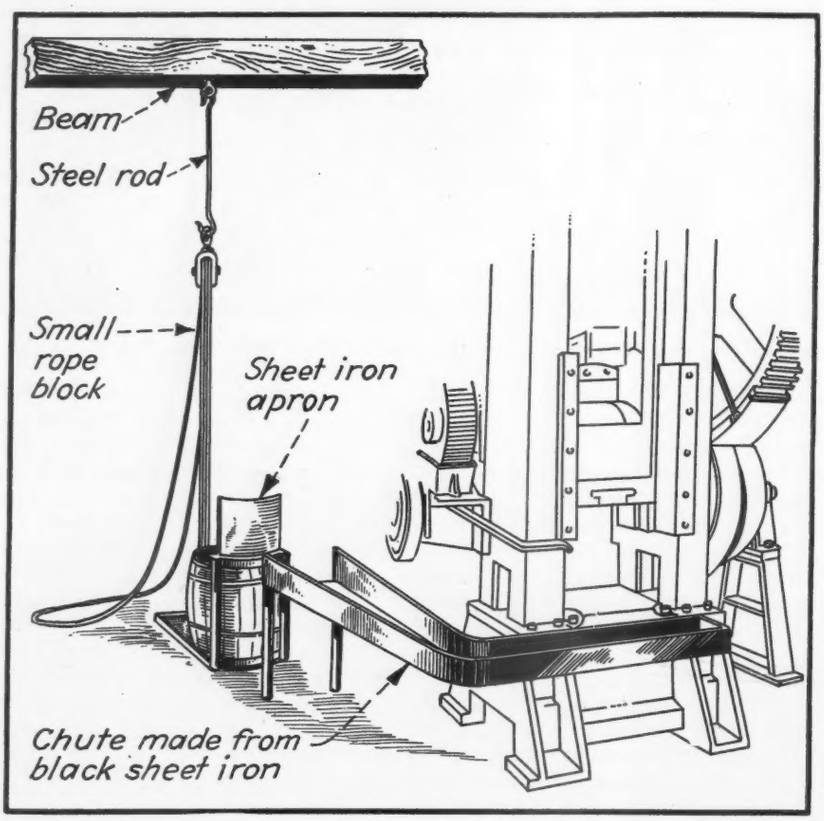
Such a recital is timely because it follows closely on the heels of the announcement of improved and expanded facilities put into operation a scant month ago by Republic Steel Corporation at its Canton and Massillon, Ohio, plants.

New equipment at Canton includes a 50-ton unit which has been added to the company's battery of six electric furnaces. Expanded facilities at Massillon give the corporation a stainless capacity in the strip department alone of 1,200 tons a month. It is now able to produce coils of cold-rolled strip as narrow as ¼ inch and as wide as $23\frac{15}{16}$ inches. Polishing, which used to be done by the inch, is now done by the foot. The Massillon plant is equipped to polish a sheet 68 inches wide by 24 feet long.

Management Shorts

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary management accomplishments. Accepted articles will be paid for

HANDLING AND MOTION ECONOMY



Barrel Lift and Chute Cut Handling Time

D. E. Cox
Time and Motion Study Engineer
Faultless Caster Company
Evansville, Ind.

One of the devices we use to economize on space and manpower is a punchpress feeding installation consisting of a barrel lift and chute. With this barrel lift, barrels containing parts to be fed through a punchpress are raised, and dumped into the chute. The chute carries the parts by gravity to within easy grasping distance for the operator.

This handling arrangement accomplishes a two-fold purpose. In the first place, it enables the materials handlers to move parts between machines and departments in large steel drums or barrels, on small hand trucks. A large container is needed in handling many of the parts, because they are bulky and too large for tote boxes. By using the small rope block it is possible for one man to load the barrels on trucks at one machine, unload them from the trucks and empty them into the chute at another machine.

In the second place, it saves the press operator's time and decreases his fatigue by delivering the parts to a point where he can grasp them easily from a sitting position in front of the press. Formerly, the operator either moved several parts at a time to a pan on the machine, from which he fed them through the press, or he removed the pieces singly from the container.

The saving in operating time has averaged from 10 to 12 per cent, and since very little maintenance is required, the chute has proved very successful.

•

For handling small lots of painted or plated parts, one plant salvages corrugated paper cartons in which parts are received from vendors, uses them with cardboard dividers.

•

Cut Handling Costs from 24c to 3c per Ton

SOURCE
The Baker-Raulang Company
Cleveland

Pallets and power truck, used by one manufacturer to handle 50-lb. bags of pigment from bagging machine to storage and from storage to car, have cut handing costs from 24 to 3¢ a ton.

The truck is a 2-wheel drive, 4-wheel steer, fork truck. Bags are placed on pallets, ten to the layer and seven layers high, a total weight of 3,500 pounds net per pallet. Pallets are stored three high in the warehouse.

•

Motion-Economized Procedure Cuts Printer's Lockup Time

SAM WEIL, *Production Manager*
Keller-Crescent Company
Evansville, Ind.

In an analysis of cylinder press lockup time, it was disclosed that the operators drew spacing material from seven cabinets arranged around the lockup stones. By actual count, even on fairly simple forms, as many as 15 or 20 trips were made to the cabinets as the form was filled in. The process

was rather haphazard and involved many waste steps and much waste motion.

Using a little rolling table, we have now tested the practice of charting the material needed, going from cabinet to cabinet in one trip, gathering all spacing material and lockup quoins required, neatly laying them out as we make the round, then returning to the lockup stone and proceeding with lockup in orderly fashion and without interruption.

We are now designing a special rolling materials buggy, on which to gather units needed for the individual lockup, and with shelves below in which to stock a supply of some of the smaller materials used in most forms. The table will also carry a strip cutter. Thus after gathering lockup materials, the operator not only can transport them to the particular stone assigned for his job, but can also wheel his buggy into the pressroom, if or when he must do some work on forms after the job has gone to press, as still happens occasionally.

Tests indicate the possibility of saving from two to fifteen minutes per form by making this change in method —a substantial economy.

EMPLOYEE RELATIONS AND SAFETY

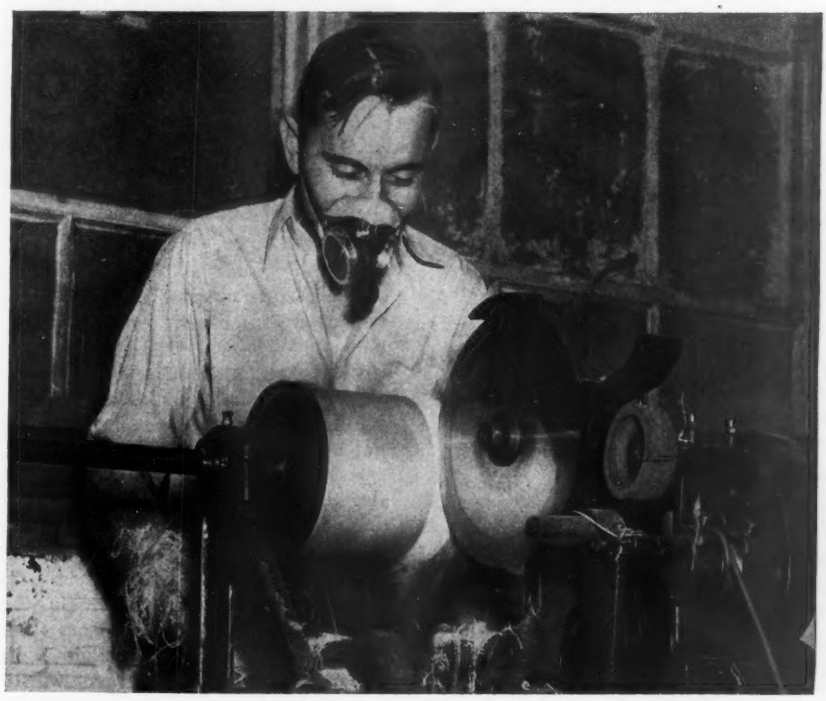
Use of Respirator Masks Ends Sickness Absences

HAROLD M. SCHERR, *Plant Foreman*
The Juvenile Manufacturing Company
San Antonio, Tex.

After a recent persual of our plant sick-list figures I was amazed to discover that 80 per cent of our absences for illness found their origin in the cloth-cutting department. After further examination of plant statistics I decided that the best method of ascertaining the cause of so much illness in this department was to call the men together and have a talk with them.

Strangely enough almost all of them had at one time or another experienced the same aggravating symptoms; constant nose and throat irritation, shortness of breath, frequent coughing, and various other respiratory complaints. Fluoroscopic examination revealed interesting findings; eight or twelve men had been periodic sufferers from a form of pneumoconiosis, a disease caused, in this case, from the inhalation of wool and cotton lint that exudes from the fabric in the process of cutting.

The use of respirator masks has completely eliminated sickness absences in our cutting department, and we heartily recommend their unrestricted use to other members of the garment trade if they desire to have healthier, happier, and more productive cutting departments.



Operators no longer inhale cloth cuttings since adoption of these respirator masks

Plant Safety Campaigns Make Safer Drivers

R. A. SHAW, *Director of Safety*
The Murray Corporation of America
Detroit

Awards to this company in annual, city inter-company safe-driving contests can be traced to our plant safety campaigns. If employees are sold on the principle of working safely, the safety habits acquired in the plant are likely to be reflected in the way they handle their automobiles when they leave the plant. We have found a correlation between the plant safety records and the records employees make as drivers —employees of plants having the poorer safety records getting into more motor accidents. Consideration for fellow employees' safety on the job engenders similar thought for the other drivers' safety, to say nothing of one's own.

As part of its city drive, the police department reports to us the names of any of our employees involved in traffic accidents. We send to the man so involved a letter pointing out the effect his accident has on the company's record, and the importance of safe driving. We ask him to "Please drive safely and protect the other fellow as well as yourself." These letters go out over the signature of the president of the company, or that of the production or industrial relations managers or the safety director—we change from time to time to keep the letters from appearing to be automatic form messages.

To show how our people catch the spirit of the thing, here's a remark our company mail driver made: "I generally catch up to the fast driver at the next red light. Why hurry to a death—it may be yours?"

•

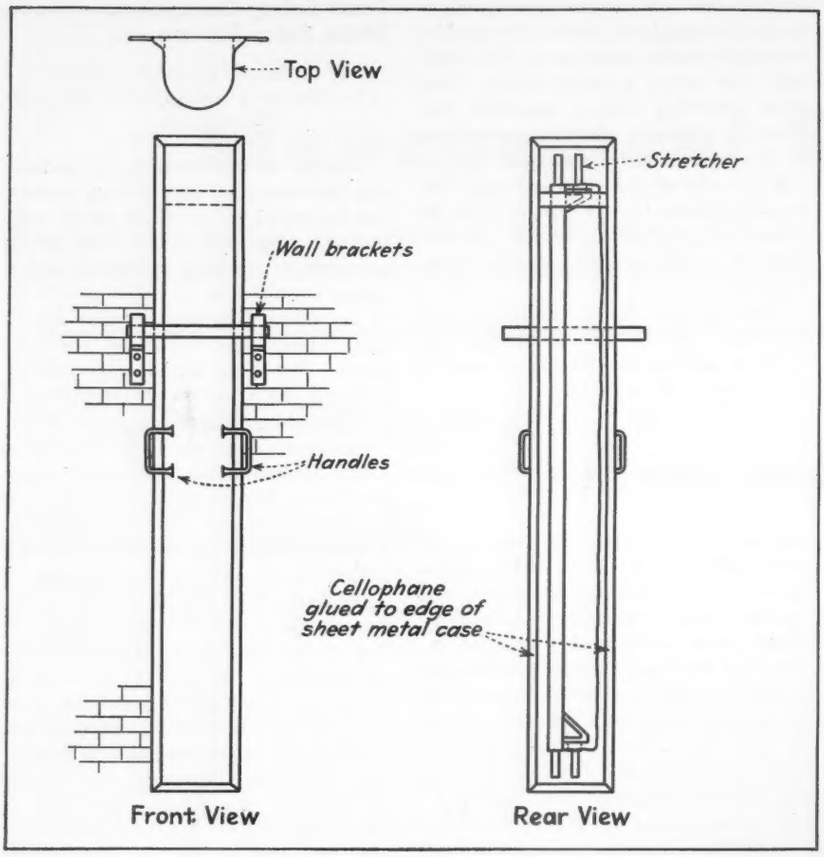
Cellophane Seal Keeps Dust Out of Stretcher Case

K. N. BANTHIN, *Oak Park, Ill.*

Periodic inspection of safety equipment in a white metal smelting plant revealed that the can-type stretcher cases were at times inconvenient to open. This condition was especially noticeable in some divisions where cans had been bumped in spite of location and safeguards.

What we considered an improved case was constructed out of sheet iron in a U-shaped section. The open side made the stretcher easily accessible, and was sealed effectively from dust and moisture by gluing a strip of sheet Cellophane to the flange on the case.

The case was mounted with the Cellophane-covered side against the wall,



and held in place with two wall brackets. To prevent the stretcher's falling and breaking the Cellophane during installation, a light sheet iron crosspiece was fastened to the case near the top.

To use, all that is necessary is: Grasp handles and lift the case off the wall bracket; lay case on the floor and break the Cellophane; remove stretcher by grasping at lower end, pulling up.

Condition of the stretcher at periodic inspections can be observed through the transparent seal.

prices stored in the same stock pile.

Where a pile contains a stock of identical pieces of identical price, such as the driving axles pictured here, only one piece is stenciled. Then, if it becomes necessary to remove this marked piece, another piece is painted with the information shown. This practice saves wasting paint and eliminates the work of stenciling all of the pieces in every pile.

When a sidecar motorcycle messenger or truck deliveryman goes for a piece called for by a foreman's ticket, he posts the price on the ticket as he withdraws the item from stock. This method saves 25 per cent over the former method of having material bills and transfer tickets matched up with the books in the office, and speeds up the work. Also, annual inventories are compiled in much less time, since prices do not have to be looked up in books.

The plainly marked prices keep storekeepers, foremen, and workmen

aware of costs, and lead them to compare costs of materials. They also safeguard a proper pricing system, although prices are also posted on stock-books on receipt. The stockkeeper compares book prices with marked prices when he checks material monthly for maintenance of stock.

Having prices right on the material also promotes constant comparison of raw material costs; foremen and workmen formerly lacked this information. Also, the open display of prices educates foremen and workmen in the value of the material, and places them in position to decide whether it is economical to replace the item with a new piece of material or repair it for further use.

PRODUCTION PLANNING AND CONTROL

Saved a Printing Bill

JOHN F. PIERCE
Director, Office Service Department
Tennessee Valley Authority

In reviewing a re-order for Central-Files-Copy paper, used for making carbon copies of all correspondence, the question was raised: "Is it necessary to have the heading 'Tennessee Valley Authority' and the words 'Central Files Copy' printed on the sheet?"

An investigation was made which quickly showed that:

1. Color distinction (green) identified the sheets as file copies.

2. Mail-room employees delivered all green papers to the Central Files unless routing slips gave other instructions.

3. Secretaries and typists separated sheets of this color from other carbon copies and routed them to the files.

The result was that the paper was re-ordered without the heading. It costs less that way.

•

Prices Marked on Material Save Accounting Time

SOURCE
Illinois Central Railroad Company

Prices paid for material such as forgings, castings, and steel stock at Paducah Shops of Illinois Central System are placed on these items with a paint pencil. Stockmen mark the prices when receiving the material. Since the actual price remains on the piece until used, it is entirely possible to have identical pieces showing different

MAINTENANCE SERVICES

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FACTORY MANAGEMENT and MAINTENANCE

McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

EDITORIALS

L. C. MORROW . . . *Editor*

Plan for Emergencies Before They Happen

EVERY YEAR THE SPRING THAWS and rains bring to many plants the threat of flooding. All too frequently this threat becomes a dire reality, and plant equipment is submerged in an irresistible flood of muddy water.

Many plants located in areas where floods are to be expected, have worked out measures for protecting equipment as much as possible, along with the methods to be used in drying out and restoring it to service. There are doubtless many other plants in less exposed locations that ought to consider what could be done to protect their property if an unexpected flood comes. In fact, methods of salvaging flooded equipment is a matter of interest to every plant, because the danger of damage by water from broken pipes or tanks, sprinkler heads, or backed-up sewers is ever present.

In any such emergency prompt action is necessary to minimize damage, but there is always a good chance that the wrong things will be done, or the proper things done in the wrong way. Hasty measures may do quite as much to increase damage as to prevent or repair it.

In an emergency there is little time to study and plan the best methods of salvaging the different types of equipment. Also, the difficulty of closely supervising a large salvage crew, to make sure that unfamiliar work is properly done, can easily be imagined.

Waste of effort and the danger of making bad matters worse by failure to take necessary precautions can be largely avoided by careful planning beforehand. Instruction of the maintenance crew in what to do and how to do it is an essential part of any such planning.

Drying Lamps Show the Way to Some New Methods

RECENTLY SO-CALLED DRYING LAMPS have been applied to many baking and drying operations, with results that show important possibilities. These lamps are practically identical in appearance with the common incandescent lamp, but there the resemblance ends. About 95 per cent of the output of drying lamps is infra-red energy, which cannot be seen. When it strikes a surface that absorbs rather than reflects it, heat is produced.

That fact is the basis for one of the most important characteristics of radiant heating: Heat is produced within an object, instead of being carried to it by convection or conduction. Hence drying, for example, may often be accomplished more quickly or thoroughly by radiant heat than by some other methods. In a number of instances, use of drying lamps has drastically cut the time required to bake lacquer and enamel finishes, or perform similar operations. At least one repair shop is using these lamps to bake the insulating varnish on rewound stators.

The simplicity and comparatively low cost of an installation of drying lamps suitable for many purposes, and the possibilities which they offer, make their use well worth investigation.

Always Some Solution for Lubrication Problems

SATISFACTORY LUBRICATION of all the kinds of equipment found in industrial plants is not always easy to obtain. A number of knotty problems must oftentimes be worked out. The fact remains, however, that these problems can be licked if enough study is put on them.

One large plant demonstrated that point to everyone's satisfaction when both production and maintenance decided that something had to be done about lubrication. Production kicked because leakage of oil from bearings frequently damaged the product, and there was too much down-time caused by bearing trouble. Maintenance was on the carpet every other day, trying to explain why.

First step was to go over all bearings which had given any trouble. Some plain bearings were replaced with the anti-friction type. All others were put in good shape.

With the help of manufacturers the proper lubricant was determined for each type of service.

Methods of application were then studied. As a result, centralized lubrication systems were installed on a number of machines, and the others were equipped with the kind of lubricating device best suited to the operating and service conditions.

Formerly the operators were expected to oil their own machines, while several maintenance department millwrights and inspectors took care of the other equipment along with their regular work. The bad features of this practice were recognized, and it was abandoned. Instead, two experienced mechanics were made solely responsible for the lubrication of all equipment.

Within a short time lubrication had ceased to be a problem, and became a simple, routine matter.

Two Ways to Cut Control Upkeep

C. E. ARMSTRONG
Plant Engineer, Caterpillar Tractor Company, Peoria, Ill.

1. Select types that require a minimum of maintenance
2. Install them in such a way as to minimize trouble

OUR IDEA OF THE WAY to start a program for inspecting and maintaining electrical control equipment most economically is to select types of equipment that require a minimum of maintenance, and then install this equipment in such fashion that possibilities of trouble will be minimized. With a plant thus equipped, the inspection and maintenance job is greatly simplified and need cause no worry if handled on a regular schedule.

In our plants we have close to 6,000 motors, in a wide range of sizes, types, and tasks. At least 90 per cent of our control switches are magnetic, operated either by pushbuttons in the cover or from a remote station. Open-type magnetic switches are protected by dustproof cabinets which are mounted in an out-of-the-way place.

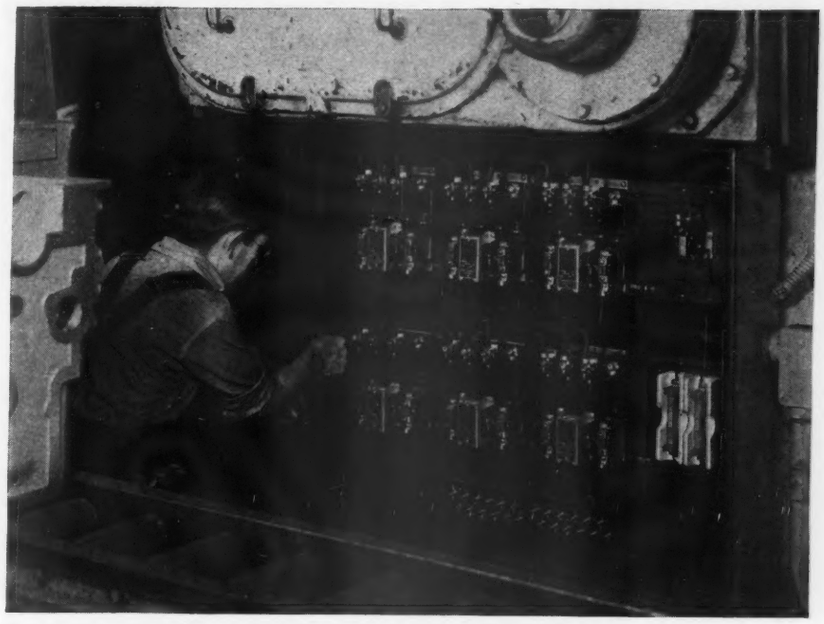
Built-to-Order Panels

Machines with four or more motors are panel controlled. These panels are made in the maintenance department's sheet metal shop to fit the equipment. They are made dustproof to prevent the inevitable maintenance expense of control that is exposed to dust. These boxes are made, of course, only for the controls that we put together in our own electrical department. The great bulk of our controls are furnished complete by the manufacturer. When they are to be used in departments where cast-iron dust, oil, or moisture are a problem, watertight housings are specified.

Resistor-type starters, both automatic and manually operated, are used on the older machines in the plant, and where motors rated 15 horsepower or over are not started across the line.

Obviously, the control equipment varies with the nature of the work performed on a piece of production equipment or machinery.

Our electrical maintenance men are responsible for the inspection and maintenance of controls by departments. The major share of each man's time is of course devoted to larger jobs, and each one is subject to call for emergency work. In between bigger jobs, and especially towards the end of the week, the electrical maintenance man is supposed to inspect controls and keep them up to standard. There is no hard-and-fast rule about just how often he shall make the rounds of the controls for which he is responsible, but it is generally understood that he is expected to get over all of those in his section at least every three weeks, while keeping up his other work.



Checking up a group of controls housed in a dust-tight cabinet, in the machine shop

The work of these men is supplemented by two other men in the maintenance department. One is a construction maintenance man who makes the rounds of the plant about once every two weeks. As he goes around looking after other equipment, he takes a quick look at the exterior of each control box. His sole interest in the box is to see whether the knockout plugs are all in place. Frequently someone will place a tool or some other hard, heavy object on a control box and thus knock out a plug.

When the construction maintenance man finds one of these plugs missing, he takes from his tool kit a couple of disks of sheet metal, which come from punchpress scrap in production departments and have been drilled in the maintenance shop for a bolt. He puts one of these disks outside the missing knockout, one inside, and bolts them together with a nut and lockwasher.

The other extra inspection comes from our motor inspector. He makes the rounds every two weeks—which is not so heavy a schedule as it sounds, since more than half of all our motors are totally inclosed and are on a four-

months' inspection routine. The motor inspector does no maintenance work on controls, but as he is greasing and oiling a motor he looks at its control. If he finds that it is in need of attention, he calls the maintenance department on the phone, or reports in writing, depending on how urgent the matter is. Also, if he finds that the controls in some departments are not being maintained properly he reports this fact.

As might be surmised from our emphasis on closing gaps left by missing knockout plugs, we are very strict about keeping dust and other forms of dirt away from controls. It is a shop rule that all control box doors must be kept closed tightly at all times. Where there exists a serious dust problem, such as in a department where cast-iron dust is present, we not only make our panels dustproof, but also specify dustproof inclosures.

One of our invariable rules is never to use a switch that is of lower rating than the motor. That is, we will use a 7½-hp. switch on any motor up to 7½-hp. rating, but on any motor between 7½ and 15 horsepower we will use a 15-hp. switch.

By using switches of adequate rating we cut to a minimum the difficulties which may arise from overloading. Once in a while, of course, a production machine is stepped up in speed or feed and a larger motor is installed without anyone remembering to replace the control with one of higher rating. When this happens the motor inspector will catch it within two weeks if the electrical maintenance man has not caught it sooner.

Our men are always on the lookout for several of the commoner ailments that can occur in electrical controls. In all fairness it must be said, however, that manufacturers of control equipment are now turning out so much better controls than they used to that maintenance problems are very much smaller than they were even a few years ago. And by keeping water, dust, and oil away from them we do our utmost to let them function properly at all times.

Two small disks which are held in place by a bolt keep dust from entering the starter cabinets through holes that are left by the accidental removal of a knockout plug

One way in which to accomplish this objective, aside from our insistence on the use of inclosures suitable for the conditions, is to mount the switches at points where they will be relatively free from exposure to harmful agents. For example, in an automatic screw department where oil haze is unavoidable, we mount the controls well up on a column or even on a truss so that they will be above the maximum oil concentration, near the work level.

In departments where the men are likely to have oily hands, we use waterproof pushbuttons, which would work as well in an oil bath as out in the air. As part of the inspection procedure the electrical maintenance man wipes out any dust, oil, or moisture that may have penetrated the housing.

Occasionally a coil burns out because a switch has become sluggish, so that the armature fails to close tightly, and leaves a gap. Once in a while we have relay trouble arising from difficulties with the cutting tools on the production machines or from hard spots in castings. When such troubles occur the machine operator is all too likely to block in the reset button. It is the duty of the maintenance man to clear away any such blocks.

Another type of trouble that sometimes occurs with switches is due to a loose lug on a wire. Our installation standards are definite, call for cleaning wires until they are bright, hot-soldering, and cooling the joint with a damp rag to set the solder before moving it in any way that might cause a loose connection and high resistance. But sometimes in spite of rules the installer may cold-solder a joint or otherwise do work that is below standard. Hence this point is something our electrical men are supposed to check when making their regular inspections of electrical equipment.

Prolonging Life of Contacts

Still another point to be watched at all times is the condition of contacts. A maintenance man is supposed to do everything possible to prolong the service life of contacts, because they are expensive. When he finds that a contact is burned or pitted, he dresses it with a fine file or burnishes it with crocus cloth. If, however, it has reached the stage where there is no more silver, he renews the contact to keep the control in good working order.

Our experience indicates that it is far more profitable to schedule inspection and maintenance on a regular program, than just to install equipment and leave it alone until it fails. Any sizable plant necessarily keeps more electricians on the payroll than it needs for major jobs when everything is running well, so that in times of trouble there will be adequate manpower.

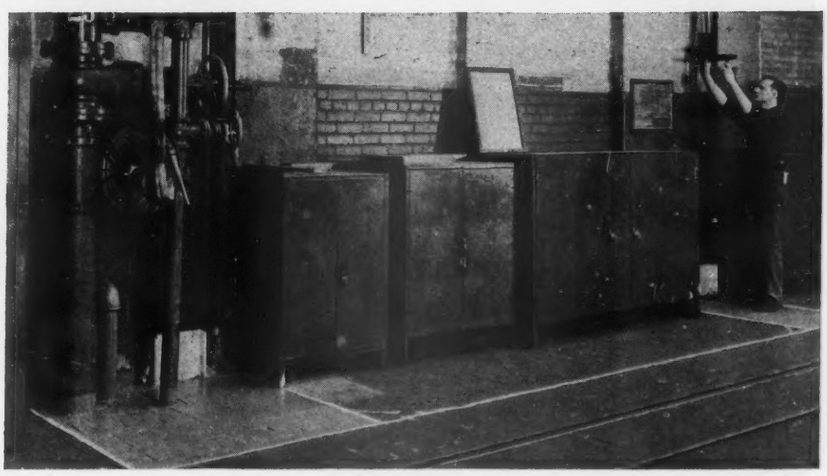
Through our method of making the electrical maintenance man responsible for the controls in a given section of the plant, and holding him to regular performance of routine inspection and maintenance work on these controls at times when bigger jobs are not pressing, we get inspection and maintenance done at little extra payroll cost above what would be required in any event.

SELECTION • INSTALLATION • INSPECTION • UPKEEP • ORGANIZATION

Keeping Emergency Equipment in the Clear

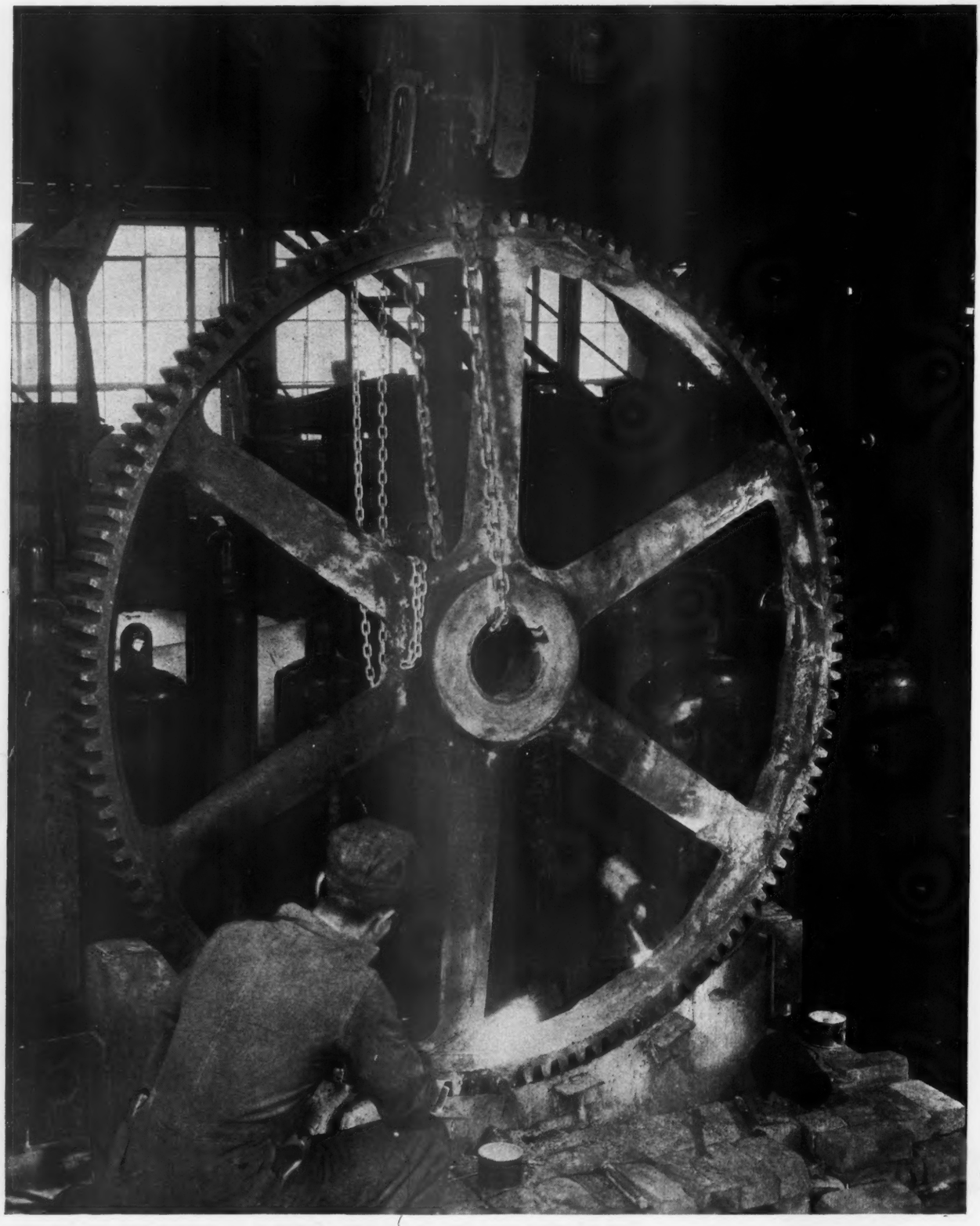
At the East Pittsburgh plant of Westinghouse Electric & Manufacturing Company, floor areas surrounding emergency equipment are painted in red, reminding all employees that the designated spots must be kept clear at all times. Were equipment or supplies left in front of the fire equipment box shown at right, opening it quickly to get at hose, nozzles, and axes would be impossible →

In case of accident, no time need be lost getting a stretcher to the scene. Neatly marked-off red plot before stretcher cabinet keeps it clear of machinery and parts



Two red safety areas show in this view. Section at left keeps a hose and fire valve clear, while small area at right insures accessibility of roof ventilator operating wheel

Savings Come With Gas Welding

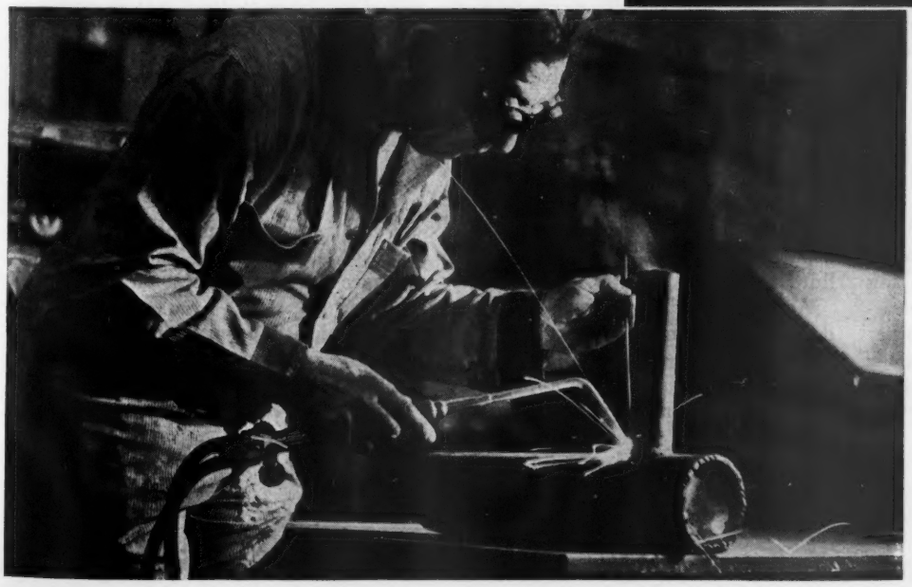


Broken in seven places, this gear was repaired in a few hours with an Air Reduction torch, saving the expense of a new pattern

A Bastian-Blessing welding outfit makes short work of silver brazing some fittings for commercial refrigerators, in the plant of a well-known manufacturer

Here the operator uses a Linde torch in forming frames made of light angle iron, by cutting out a V-shaped section of one leg and then bending and welding

When emergency need arose for a piece of 5-in. pipe with a 2-in. outlet at right-angles it was soon made up in the shop, with the help of a Torchweld outfit



Bonus Cuts Costs, Ups Pay, 12%

R. H. PRATT

Superintendent of Standards, Post Products Division of General Foods Corp. Battle Creek, Mich.

After leaving Pennsylvania State College Mr. Pratt went to The B. F. Goodrich Company as a student engineer, was later transferred to the time-study and estimating department. In 1931 he became a time-study man in the Diamond Crystal Salt Division of General Foods Corporation, at St. Clair, Mich. There was then no wage incentive plan in the plant; within two years practically all production jobs were standardized and put on incentive. In 1935 the plan was extended to cover maintenance work. Two years later he came to Battle Creek

FIVE YEARS AGO the work of our maintenance department, consisting of 200 employees, was placed on incentive. Since 1936 88 per cent of all maintenance work has been covered by standards. Since that time earnings have been increased by about 12 per cent and maintenance costs have been reduced by almost the same percentage, the exact figure varying somewhat among the various departments.

It has been almost universally claimed that maintenance work is too varied for incentives, or at least it is so varied that standards would be too costly to establish. In fact, this was our belief at one time, but the results speak for themselves. Five time-study men, with some outside help, were able to establish the basic time values necessary in setting tasks. This task required about one year's time and we still have one full-time observer to take care of the work involved in changing standards for new equipment or methods.

Incentives now require no justification. I should like, however, to mention two things that influenced our thinking on the matter. In the first place, a measured task is a protection to the worker against unreasonable demands made upon him, which is an important matter in maintenance work, with its many and varied tasks. Second, a measured task with incentive payment requires that supervision facilitate the work in every way in order to avoid worker complaint.

It is to be understood that we are dealing here with maintenance work on general factory equipment that is common to all plants, irrespective of the product manufactured. When speaking of basic units, such as "inch of weld," or "unbolt flanges," we are concerned with work of a general nature.

Third Class Predominates

Three classes of work have to be considered: (1) Uncheckable items, such as trouble shooting in the electrical department, which is not visible in the completed job; (2) repetitive routine work such as oiling and motor inspection, or the building of waste cans in the sheet-metal shop; (3) non-repetitive jobs for which time standards must be developed by a tabulation, or addition, of several unit values. In a maintenance department the work falling within this third class predominates.

Any time study worthy of the name deals in "elements" of the task which are later combined to yield the time for the job as a whole. Or by appropriate treatment the elements may be placed in tables or curves for use when setting times on a variety of tasks of the same general character. The same principle holds for setting time values in maintenance work. Fundamental facts of the job are selected and the values determined are then combined as required by the character of the job for which a time is to be set.

In the maintenance machine shop the procedure is no different from that followed in production shops. Machining times were calculated from the characteristics of the machines, and tables of time values established. This was done on such work as turning, shaping, drilling, and boring. It was found necessary, however, to check these calculations by actual time studies.

For each class of machine there were set up special values for handling which covered, for example, chucking, placing work on centers, setting steady rest, and changing drill. It was found, incidentally, that these handling values could be used in other plants of the corporation, although machine-time values vary because of differences in machine equipment.

The pipe-shop units included such work as installing bolts and nuts, or their removal, drilling holes in concrete, hacksawing, making up (assembling

pipe and fittings), and similar tasks.

Basic units were established in the electrical shop for such tasks as form and install conduit, install wire, make splices, and install hangers. Time values were set according to the type of conduit bend and size, and according to wire size. Other basic units such as drilling, sawing, and fastening are the same as those in the mechanical departments of the plant.

In sheet-metal work the times per rivet, per inch of solder, or per inch of weld afforded natural divisions of the work which could be used as basic elements.

Enough has been said to indicate that natural divisions of work were selected. Time values were set for these units and entered in table or curve form for later use in setting synthetic times for the varied tasks in the maintenance department. The table indicates how values for acetylene welding are arranged.

One checker, who reports functionally to the time-study department, is located in each maintenance department, except in the millwright division where the volume of work requires two men. These men are not allowed to dictate how the jobs shall be done; that is the function of the foreman. Neither do they set the time on the job before it is done, because it is impossible to foresee difficulties that may be encountered. If the task were to be set beforehand and unexpected difficulties encountered, there would be plenty of arguments about the adjustments that should be made.

Therefore we avoid all such situations by having the checkers describe the job according to the way it was actually done. Furthermore, the checker may not say that the work was done wrong and write up his description accordingly; he may consult the foreman, but the foreman's decision stands.

I have used the word "describe" advisedly, for that is just what the checker does. He is located in the department to which he is assigned and knows what jobs are under way; in fact he examines them while work is in progress to observe the method used. When the job is completed he prepares a description of the work done, showing by a sketch, if possible, the method used. The sketch indicates what parts, such as tees, ells, and pipe lengths were removed and what new combinations were installed.

The tables of basic unit values now come into play. Suppose the checker's write-up shows that 30 2-in. fittings are to be unscrewed and 46 2-in. fittings made up, or installed. Basic time for the first operation, taken from tables, is 4.5 minutes. The time for installing each of the 46 2-in. fittings, also taken from tables, is 4.9 minutes.

All items entered on the write-up are treated in the same way with the result that 13.5 clock-card hours are recorded as spent by the two men on this job, as compared with 13.8 hours which a synthesis of basic-unit time values indicates should be spent. The write-up is checked by a head checker in the time-study office before it is sent to the payroll department for calculation of premium.

Since the purpose of this article is to indicate how time standards are used in our maintenance work, the premium plan will not be described in detail. Suffice it to say that the men are compensated for hours saved below standard at a rate based on their hourly pay rate. The premium is paid weekly with the regular hourly earnings. Other arrangements are obviously possible once the comparison is had between actual and standard hours.

The foreman of the maintenance department has a part to play in the checker's write-up. It has been mentioned that he decides how a job is to be done. He also reviews the write-up before it is sent to the head checker in the time-study office. This procedure allows the foreman to check the efficiency of his group and, incidentally, to see whether the checker has been accurate in his description.

If the efficiency is low, the write-up is discussed with the workmen as to the reasons for it, which has the favorable result of acquainting the men with the method of calculating the standard. Since copies of the basic unit time values are in the hands of the foremen as well as the checker, the make-up of the standard time set on the job can easily be explained.

The premium earnings and reduction in maintenance costs mentioned previously have been secured with a minimum of complaint. The head checker spends much of his time in the shop with departmental checkers and thus has a chance to know each worker and to adjust at once whatever misunderstandings may arise. In addition, key men from each maintenance department are given a four to six weeks' period in the time-study department. These men do not set standards on their own work but take time studies to check standards that are being used on work in their department. They are able, therefore, to explain the method of basic time calculation to their fellows. Every effort is thus made to take the mystery out of time study.

The question will naturally arise as to the costs of administering this plan. Its value would be questionable if the cost of application were greater than the value of the savings, despite the increase in worker earnings and reduction in time of doing the work, because wages could be increased in other ways. From our experience, I would say that the plan as outlined will earn its way in a department of 75 men; it begins to pay dividends when the number of employees is higher.

ACETYLENE WELDING

Thick. of Metal	LENGTH OF WELD IN INCHES																						
	2	3	4	5	6	7	8	9	10	12	14	16	18	20	24	28	32	36	40	44	48	52	56 Over
1/16	2.4	3.4	4.3	5.0	5.7	6.4	7.0	7.6	8.0	9.0	9.8	10.6	11.4	12.0	13.2	14.0	15.4	16.6	17.6	18.9	20.2	21.3	0.40/In.
1/8	3.0	4.3	5.4	6.4	7.3	8.2	9.0	9.7	10.4	11.7	12.9	13.9	15.0	15.8	17.8	19.6	21.8	24.1	26.4	28.6	31.2	33.8	0.65/In.
1/4	3.8	5.4	6.2	8.2	9.4	10.5	11.3	12.3	13.1	14.8	16.3	17.6	19.1	20.9	23.0	25.2	228	30.2	32.8	35.6	38.4	41.6	0.80/In.
3/8	4.3	6.7	8.0	9.5	11.0	12.3	13.3	14.4	15.3	17.3	19.0	20.8	22.4	24.0	27.1	30.2	33.6	36.7	40.0	44.0	47.0	51.0	1.00/In.
1/2	4.8	6.9	8.9	10.7	12.4	13.9	15.1	16.2	17.5	19.8	22.0	24.0	26.1	28.0	31.4	35.0	38.7	42.1	46.0	49.7	53.7	58.2	1.10/In.

CONSTANTS

Change Tips - Light Torch 1.7 Change Gas or Air Tanks 6.0 Truck Portable Equip. 0.02/Feet

Basic unit time standards used in gas welding. Similar tables have been developed for other types of maintenance service work

"Put the Insulation Tester On It"

There's nothing gained, and much may be lost, by taking a chance that the insulation of electrical equipment is in satisfactory condition. When it breaks down, current takes short cuts and bypaths and there's likely to be trouble aplenty. All of which can be prevented by simple tests that are easy to make and will tell whether the insulation of a machine or circuit can be absolutely relied on

Little chance that the insulation of this generator will break down without giving any warning, because its condition is checked up at frequent intervals with a General Radio outfit

Low resistance between commutator bars means trouble and repairs if it is not remedied in time. That's why this commutator is being checked with a General Electric insulation tester

A small transformer gets a shot of high potential from an Ideal insulation tester having a range of 500 to 2,500 volts, to make sure that the windings can stand electrical stresses in service

A motor has to have good insulation and no doubt about it, in order to get by this Leeds & Northrup test set. It is located in the test room and leads are run from it to the motor department

No trouble yet with the d.c. generator in a large sugar refinery, but to make sure that none is in the offing a Biddle Megger is used to measure insulation resistance during a routine check-up

Figure 1. Inclosed street lighting units mounted on 25-ft. poles make it easy to detect trespassers in the yards of this plant

Lighted Yards Say "Keep Out"

At night trespassers may slip by guards and barriers, but can't evade protective lighting; that's why it is one of the most effective safeguards a plant can have

G. G. BOBST
Illuminating Laboratory
General Electric Company
Schenectady, N. Y.

PLANT PROTECTION against trespassers, whether harmless or bent on mischief, is a necessity which is getting an increasing amount of attention from industrial plant managers.

To obtain complete protection it is necessary to do more than add new patrolmen to the force. They will most certainly help, but complete protection can be obtained only by a balanced combination of several precautionary measures, prominent among which is lighting. Protective means that are adequate during the daylight hours lose their effectiveness at night if they are not supplemented by satisfactory and well-planned illumination.

To lay down any set of rules for lighting an industrial plant would hardly be possible. The great diversity among plants, both in layout and type of manufacturing processes, makes each application a new problem. For example, one plant may be highly concentrated in a small area, in which case general lighting should be employed which will illuminate the buildings and the surrounding area. Another plant may be spread out over a large area. Here the best method is to illuminate the fence or property line surrounding the plant, and provide lighting of low intensity in the inclosed area.

From these examples it can be seen that there are two basic types of lighting generally applied to the exterior of industrial plants. These types may be described as area lighting, as illustrated in the first instance, and property-line lighting supplemented by area lighting, as in the second example. A third method of lighting, sometimes used for emergencies, involves mounting searchlights in strategic positions so that if needed they can be used to

illuminate the area outside of the property line of the industrial plant.

Each of these three types of lighting may be applied in several different ways, dependent on such factors as economy and adaptability. Looking first at fence-line lighting, several different applications immediately come to mind.

One industrial plant recently completed an installation in which inclosed street lighting units using 300-watt lamps are mounted at a height of 25 feet along the property line. These units are supported by poles which are incorporated as part of a 10-ft. fence completely surrounding the plant. Poles with lights are spaced approximately 150 feet apart in the fence line. The illustration shows this installation.

The same method was followed by an oil company in lighting some of its tank farms. In this instance, an open type of unit is used at a mounting height of 30 feet, with the same spacing of 150 feet.

Use of the inclosed unit is usually preferred over the open type. With an inclosed type of unit having a refractor it is possible accurately to control the light output from the incandescent lamp. It is used to obtain an asymmetric distribution of light which will intensify the illumination along the fence line where it is most needed, and decrease the light thrown into the area and outside the fence. The unit has a shielded light source which keeps the direct glare of the bare lamp from the eyes of the patrolman, affording him better visibility. It also has the advantage that it is easy to maintain and is weather-proof.

Floodlights Along the Fence

A second method of fence lighting is to use 1,000- or 1,500-watt, narrow-beam floodlights. This type of lighting is not so effective as that produced by the pendant-type luminaire, but it is less expensive. The narrow-beam floodlights are mounted along the fence line in pairs on poles at a mounting height of at least 40 or 50 feet. The long throw of the narrow beam makes it possible to space these units from 400 to 500 feet apart.

Chief difficulty encountered with the use of narrow-beam floodlights on such long spacings is that the resultant lighting will be spotty. In order to project the light 200 or 300 feet it is necessary that the floodlight beam have a high maximum candlepower. Therefore all the light coming out of the lamp must be concentrated into a narrow beam. The result is that most of the light from the lamp is projected towards a spot 200 to 300 feet away from the mounting position.

With the street lighting luminaires described previously, smaller lamps (300-watt rating) are used and spaced at intervals of 150 to 200 feet. Distribution is of the asymmetric type, which projects light up and down the fence line, and there is an overlapping between units which results in an even level of illumination along the whole fence line. Higher wattage lamps in floodlighting units spaced at less frequent intervals will not give as effective distribution as the street lighting units. When properly applied, however, such lamps will give adequate lighting for certain types of installations.

Either type of fence lighting described before should be supplemented by area lighting. The supplementary light need not be of as high intensity as the fence lighting, but it should be sufficient to detect prowlers.

There are two principal methods of lighting yard areas in industrial plants, the procedure followed depending mainly on the layout of the plant. If the buildings are located side by side, from 150 to 250 feet apart, the best method is to mount floodlights on the sides of the buildings or the edges of the roofs and direct the beam into the area. Floodlights should be placed on both buildings flanking the area in order to eliminate shadows which would result if the lighting were done from only one source.

Floodlights for this application should have a wide beam to give a large spread of light and low maximum-beam candlepower. This combination provides a better overlapping of the beams and resultant more uniform distribution of light.

As the distance between buildings is increased, floodlights of narrower beam must be used in order to get the necessary high candlepower required to build up the illumination level at distant points.

When the distance between two buildings becomes too great for efficient lighting from the buildings themselves, or in plants where the shops are built around a large area, a method of area lighting may be used which has proved to be very effective. A steel pole is mounted in the center of the area. At the top of the pole there is a large metal ring to which can be fastened as many floodlights as are required by the size of the area. The floodlights should be mounted from 40 to 50 feet high, depending on the size of the area. The larger the area, the higher the floodlights must be mounted.

Mounting height of the floodlights should be given careful consideration. It is an important factor because it definitely affects the ability to see under the lights. With smaller areas where it is not necessary to project the light great distances, the wide-beam floodlight is used at the lower mounting height. This floodlight, because of its greater spread and low maximum candlepower, does not cause discomfort to people walking or working under it. As the area gets larger and it becomes necessary to project the light farther, a narrower beam with higher maximum candlepower is required.

The question of how much light to use, is dependent on so many factors that it is difficult to establish any set rules that will apply in every case. For instance, if the buildings and surroundings are light in color and therefore have a high reflection factor, the amount of light required will be less than if the buildings and surroundings are dark and absorb a considerable amount of the projected light.

Better to Light the Buildings

Experience with many different applications has indicated that if the total wattage of the floodlights covering an area is equivalent to from 0.04 to 0.06 watts per square foot of the area and the application is well planned, the resultant illumination will in average cases be satisfactory. It should not be forgotten, however, that many circumstances can readily change these values. They should be considered only as average for general applications.

These methods of area lighting are used principally to supplement fence lighting. This type of lighting is not readily adaptable to industrial plants consisting of two or three buildings in a small, compact area. Where there are one or two buildings in a small plot of ground, the best method is to light the buildings and let the spill light from the floodlight beam and the reflected light from the building surfaces take care of the surrounding grounds.

The third method of protective lighting, involving the use of searchlights, has been used effectively by many industrial plants. The searchlight is mounted on top of a guard house or building and is equipped with a control handle so that the beam can be directed by the guard from within. Mobility of this type of installation is a great asset, since the beam can be projected in any direction and used to supplement the area or fence lighting when there is the slightest suspicion of trouble. The searchlight has a narrow beam and high candlepower which enables it to highlight small areas at great distances. Most used type is the 18-in. incandescent with pilot-house control.

Maintenance Service Shorts

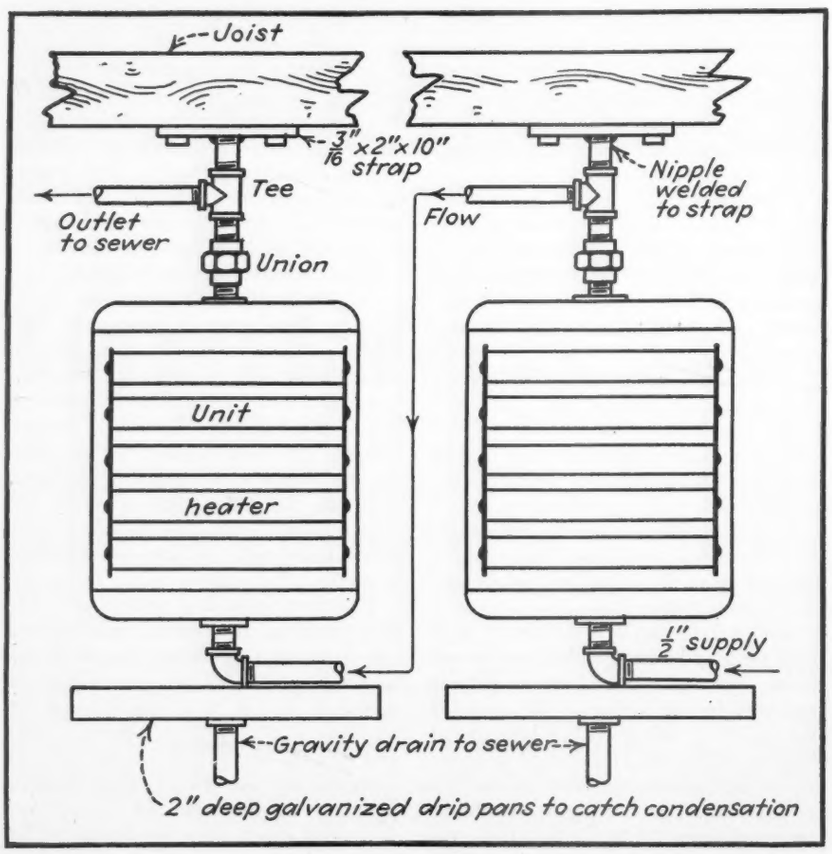
Readers are invited to contribute brief illustrated articles reporting out-of-the-ordinary maintenance accomplishments. Accepted articles will be paid for

HEAT, LIGHT, AIR CONDITIONING

No Summer Vacation for Unit Heaters

R. C. Clock, *Freeport, Ill.*

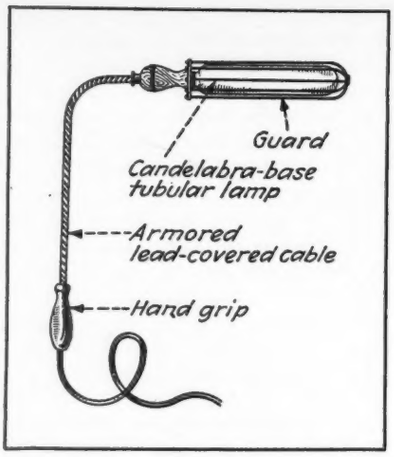
Unit heaters will serve as fairly efficient cooling units during the summer months when supplied with water at about 55 deg. Fahrenheit. Two of these units may be connected in series as shown in the sketch, thus using the water twice before discharging it to the drain.



Each spring, at the end of the heating season, the unit heaters should be taken down and thoroughly cleaned, blowing the lint and dust from the outside of the core with a sal soda solution. Fan motors should be cleaned at the same time. The unit is then ready to install as a cooling unit.

After the brackets and piping are in place, they should be left in position from year to year so that it is a relatively simple matter to change the units from their heating positions to cooling positions in the spring, and back to heating positions again in the fall. With this arrangement unit heaters are kept working all year long.

One unit of average size will comfortably cool an inclosed office space about 20x40x12 feet, or the units may be installed at hot spots along assembly lines with equally good results.



Extension Light for Hard-to-Reach Locations

S. H. Coleman, *Roanoke, Va.*

It is often impossible to light certain maintenance or inspection jobs effectively with ordinary extension lamps. This difficulty is frequently encountered where work is to be done on hard-to-reach sections of more or less complicated plant machines having parts so closely spaced that they interfere not only with placing the lamp close to the job but also with the passage of light from an external source. For such jobs, a small-diameter, candelabra-base lamp and guard, attached to the end of a semi-flexible extension, is often the answer to an otherwise knotty problem of temporary illumination.

Such a light can be easily assembled from standard electrical parts. The lamp itself is the tubular-shaped type commonly used for display lighting, and has a bulb diameter only slightly greater than that of its base. The special extension is a length of lead-covered armored cable containing two No. 14 A.W.G. conductors. This cable is approximately 5/8 inches in diameter, and since the internal lead covering has a stiffening effect without interfering too much with flexibility, it is much more suitable for the purpose than the comparatively limber types having a single flexible steel covering.

Production Up 200 Per Cent in Hot Weather

SOURCE
Carrier Corporation
Syracuse, N. Y.

In a New England plant that manufactures a product whose components are adversely affected to a serious degree by high humidity, production during the summer months was increased between 100 and 200 per cent after the installation of air conditioning equipment. A direct saving is also afforded by preventing the materials used from "setting up," a condition which requires a large amount of extra work to put them into usable shape.

Temperature in this plant is maintained within plus or minus 10 degrees Fahrenheit the year round, and humidity within plus or minus 3 per cent.

ELECTRICAL UTILIZATION

Neon Lamps Used to Check Motor Slip Speed

SOURCE
The Reliance Electric & Engineering Company, Cleveland

In addition to the expensive equipment with which the test department is supplied for obtaining speed values of a.c. machinery, a simple, portable unit employing neon lamps has been constructed which is as easy to use in the field as in the shop.

Four, clear-bulb, 3-watt neon glow lamps arranged as shown in the illustration are used in this device. Use of four lamps is necessary because they are made for 115-volt circuits and in order to connect them directly in the motor circuit, as must be done in testing, provision must be made for operation on 220 and 440 volts.

The lamps are mounted in four standard lamp bases fastened to a small board. A conical steel hood painted black inside keeps out other light rays. On the back of the board is mounted a three-pole, two-way switch. Thrown in one direction it connects the lamps in two parallel groups of two lamps each in series, for use on a 220-volt circuit. When thrown in the opposite direction the switch connects all lamps in series, for a 440-volt circuit.

For checking motor slip speeds these lamps give more accurate results than are obtainable by some other methods, and are more convenient to use especially when the end of the motor shaft is inaccessible. They can be used for obtaining the slip speed of any a.c. motor with the exception of those operating at more than 100 r.p.m. slip.

In use the light is directed onto the end of the shaft and the number of revolutions per minute counted. Marking the end of the shaft with a single chalk mark makes it easier to count the revolutions. Use of a stop watch increases the accuracy of observing the time interval. Subtracting the slip in revolutions per minute from the synchronous speed gives the motor speed.

•

If Capacitors Give Trouble, Check the Temperature

NORMAN C. MÜLLER, *Oberlin, Ohio*

Some years ago a local plant installed a capacitor to correct the power factor. For about a year there was no trouble with it, except for the burning out of a discharge coil.

One exceptionally hot day, however, there was a loud boom, the power went off, and oil started running out of the housing. After clearing the line we opened the housing and found nine sections badly bulged. Most of the bad tanks were in the top section. The manufacturer of the capacitor sent replacements along with an engineer, who checked everything before putting the capacitor back on the line.

There was no more trouble for about a week, and then two more tanks blew up in the top section. On the advice of the power company the capacitor was moved to a cooler location. After that only one section went bad, probably caused by overheating in the former location.

In line with this experience, whenever we have trouble with a condenser located on a motor or in a starter, we put it in a cooler place, or make provisions for better ventilation. In nearly every case this change has corrected the trouble.

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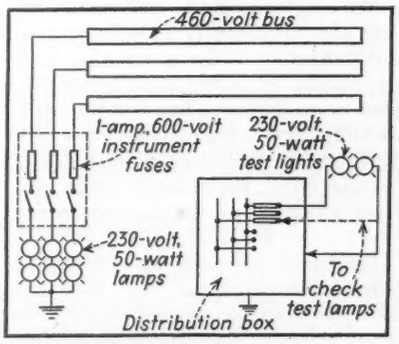

Simple Test Outfit for Locating Grounds

JESS F. CLACK, *Plant Engineer*
Ivanhoe Foods, Inc., Auburn, N. Y.

The illustration shows a handy test outfit which I have found convenient and easy to use in locating electrical grounds in the distribution system of a multi-story factory covering 3½ acres.

Switch and fuses are mounted in a small wooden box. Lamps can be mounted on one side or end. Their voltage must, of course, be chosen to suit the system.

Tests for grounds are made by connecting the test box as shown and closing the switch for several seconds. If no grounds are present the lamps will glow at reduced voltage. When a ground is present, the two lamps connected to

With this device, using 115-volt neon glow lamps, a.c. motor speeds can be measured

the grounded phase will go out, or glow only dimly, depending on the resistance of the ground.

Open one circuit at a time to locate the one carrying the ground. Note the floors or distribution boxes that are supplied through the switch that, when pulled, clears the ground. Next, open the switch in the test box. The system now has no ground on it except that caused by the fault.

For the next test a couple of test lamps connected in series are required, with two long flexible leads of considerable length. Test the lamps by touching leads to two phase wires. Then clip the lamps to one wire of a phase in one of the suspected distribution boxes, and to ground. In the absence of a ground on this phase the lamps will glow dimly. Test each phase in turn. If any one shows the presence of a ground pull out fuses on each circuit until the normal, no-ground glow appears.

When a box containing a grounded line is found, leave the lamps connected to an ungrounded wire, and burning brightest, and place them where they can be seen when you work on the circuit carrying the ground.

When the ground is cleared, both lamps will glow dimly.

If moisture is present and grounds are suspected in conduit boxes, they can easily be located by removing each cover in turn and, with the circuit energized, using a clean, dry stick of the proper size and length to move the conductors. When the grounded joint is touched the test lamps will flicker, or glow normally. Usually the slight spit of the arc to ground can also be heard.

By pushing the conductors around so as to clear the ground, until permanent repairs can be made, production on the machine or circuit involved usually need not be interrupted for any length of time.

BUILDINGS, SERVICES, MAINTENANCE

Paint and Tags Identify Piping and Valves

THERON W. BEAN, *Vallejo, Calif.*

Marking pipe lines and valves for easy identification saves confusion and costly mistakes. The name of a pipe line should be briefly stenciled on the pipe or insulation at frequent intervals, as H.P. Steam, Lehr Gas, and so on. Each system should be painted a distinctive color, for example, green for fresh water, yellow for gas, red for fire lines.

Important valves should be identified with numbered brass tags about 1½ inches in diameter, chained to the valve wheel or stem. The purpose or function of these valves should be briefly but clearly indicated on a chart, blueprinted or mimeographed copies of which should be posted at appropriate locations about the plant.

In a large factory I found it best to divide the valves into groups rather than to try to cover all valves on one chart.

•

Scrub—Rinse—Dry Units Save 152 Man-Hours

SOURCE

Finnell System, Inc.
Elkhart, Ind.

Floor maintenance costs are on the toboggan in a Chicago screw-machine plant. Reason—two combination scrubbing, rinsing, and drying machines.

Floor area in this plant totals 640,000 square feet. Floors are half hardwood, half cement. They were so soaked with oil that they had to be covered with sawdust to save the men from slipping. It used to take 27 janitors to make even the slightest show of cleanliness.

With the installation of the machines, a scrubbing schedule was worked out which allows for the complete cleaning of 240,000 square feet per night. There are four men on each of the crews, and the crews are on an 8-hour shift, making a total of 64 man-hours per night.

This compares with 216 man-hours under the old 27-janitor plan. Daily labor saving amounts to 152 man-hours.

To this substantial dollar saving add the fact that floors are really clean and free from oil these days. Fire and accident hazards have thus been literally washed out. Not to be forgotten, also, is the saving on sawdust. It comes to 13 bags a day—about $100 a month.

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Now is a good time to inspect fire extinguishers, particularly in the South, for this winter's unusual cold may have damaged certain types of extinguishers not designed to withstand such low temperatures.

•

Correction

The accompanying illustration shows the plant of Inland Manufacturing Division of General Motors Corporation, at Dayton, Ohio. This illustration was used in our November 1939 issue in connection with a short article telling of the installation of glass which had eliminated glare and at the same time reduced heat penetration.

The November article stated that "actinic" glass had been used. We now find that the word "actinic" is a proprietary word, and that glass made under this proprietary name was not used. The fact is that the installation consisted of ¼ inch hammered glass sold under the trade name, "Aklo." The surfaces had been specially treated to reduce glare. The other facts given in the article were correct, the glass eliminated 60 per cent of the glare, and reduced penetration of heat into the plant by 78 per cent.

Long Live BEARINGS!

Three ways to help: consider the effect on your oils of LOAD, of HEAT, of CONTAMINANTS

LET'S LOOK at bearing lubrication through the eyes of your plant engineer—a highly practical person. He usually does little talking about lubrication theories. He sees lubrication as one of the important means to the end he's after . . . which is to give you all the operating efficiency your machines can deliver at the lowest cost.

But he's thinking always of your actual machines—some of which have to work under abnormal conditions. Does it pay you to run one of them at a fairly consistent overload? Very well; he'll just have to adjust his lubricant to that overload. Perhaps another one has to inhale a lot of sulphur; a third works in atmosphere choked with dust. He'll just allow for those contaminants in figuring what oil best does the job, and how best to purify it.

Among the many conditions he deals with, in choosing and controlling his lubricants, he's certain to lay emphasis on these three: operating *loads;* range of bearing *temperatures;* extent and kind of *contamination.*

The Load on a Bearing

The job of a bearing lubricant, stated simply, is, of course, to form an oil film that keeps the metal of the journal from touching metal of the bearing. It's always easy enough to agree on basic theories.

But let's suppose that in one of your bearings you've figured on a normal unit of pressure of 500 lbs. per sq. in. Under that load the oil you're using maintains a perfect oil-wedge formation, like that in Fig. 3 above. Later, it happens to make sense for other reasons to throw an extra 200-lb. load on that bearing. As the journal is pulled downward, the oil film on the pressure side becomes thinner . . . and thinner. Does it reach the danger point? That depends on what adjustments your engineer has made in his oil.

How Much Heat?

Yet he can never deal with this problem in isolation. He must at the same time keep in mind the bearing temperature. Temperature, as you know, acts upon oil viscosity both as cause and effect. Is viscosity too low? The oil may be squeezed out—result: metal-to-metal friction—and up goes the heat. Yet too heavy an oil sets up excess fluid friction, generating and holding heat: bad first for the oil; soon after, hard on the bearing.

Here, too, your engineer gets the effective lubricant only by considering in each of your bearings *all* the factors that may alter the temperature.

Three Stages in the Formation of the Oil Wedge

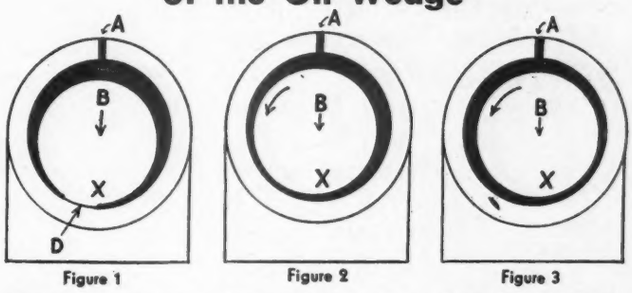


Figure 1 — Journal (X) at rest. Metal-to-metal contact and high-pressure point at (D). Load (B) vertical. Lubricant-introduction point at (A).

Figure 2 — Journal (X) starting in motion. Oil film and wedge create high-pressure point where metal-to-metal contact existed in Fig. 1.

Figure 3 — Journal at full speed. High-pressure point has moved to the right following direction of journal motion and pressure of oil wedge.

Contamination—and Control

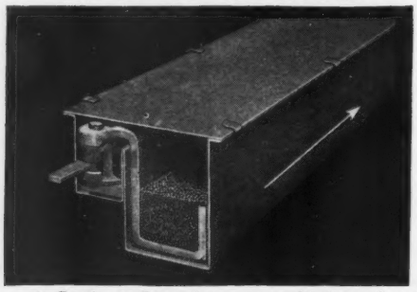
Then there's the question of contaminants of all kinds. Your engineer never forgets the active agents that set busily to work on a fresh lubricant as soon as it's in. He has to know where oxidation may occur with each lubricant. He knows when the resulting sludge is apt to fill up oil grooves or clog feed lines.

At least, he knows all these things to watch for, and many others, too, if he's going to insure your bearings the care that they deserve. Shell has often helped, from its years of experience in a variety of bearing problems, to supply the one or two clues which may be all you need to improve your bearing operation or to lower your operating costs. Call in your Shell lubrication man. You and he have the same end in view . . . longer life for bearings.

SHELL

SHELL Industrial Lubricants

CONVEY-ELEVATE *Safely* IN 1/4 THE USUAL SPACE



★ *Section through a new Horizontal Closed Circuit Redler Conveyor with driving part of chain in separate compartment from material. Redlers convey-elevate cleanly, in little space; they eliminate many explosion hazards.*

Avoid dirt and dust, Eliminate feeders, Do away with elevator pits, Eliminate contamination, Avoid explosions with . . .

ENCLOSED COMPACT REDLER CONVEYOR-ELEVATORS

● Pioneers in all types of bulk Material Handling equipment, S-A is also the exclusive manufacturer in the United States and Canada of Redler Conveyor-Elevators. Regardless of the type of equipment sound engineering recommends for your particular requirement, *S-A can fill the bill.*

The many savings possible by using Redler Conveyor-Elevators in the right places for handling pulverized, granular, small lump and flaky materials are thoroughly covered in Redler Engineering Handbook No. 42. Complete with dimensions, specifications, capacities, and other engineering data.

STEPHENS-ADAMSON MANUFACTURING COMPANY
1 RIDGEWAY AVE.
AURORA, ILLINOIS

You Want to Know

more about the items mentioned on this page.
Letters to the addresses given will bring information

● IRON AND STEEL PRODUCTS subject to oxidation and scaling at high temperatures can be protected (up to 1,832 deg. F.) and given longer life by "Metcolizing," a new process that applies a thin coat of aluminum which alloys with the base metal. Nickel and nickel-chrome alloys can also be treated to protect them from sulphurous gases. Metallizing Engineering Co., Inc., 21-07 41st Ave., Long Island City, N. Y.

● INDUSTRIAL-RELATIONS-MINDED executives will find a condensed collection of papers presented at the 1939 Industrial Personnel Institute at Purdue University of value in formulating their personnel policies and putting them into practice. Free copies of "The Employee's Viewpoint Toward Personnel Industrial Relations and Training" may be obtained from Purdue University, Lafayette, Ind.

● BURNS and their treatment are discussed in a pocket-size pamphlet handy for safety engineers and others to have around. First aid measures and hospital treatments are described. 50c. Harold J. Davis, 3927 East Admiral Place, Tulsa, Okla.

● FLUORESCENT LIGHT FIXTURE screws into any standard ceiling, wall, or pendant socket—no extra wiring or accessories are needed. Burns 15-watt fluorescent daylight tube. Van Dyke Industries, 2857 South Halsted St., Chicago.

● BEEN THINKING of using photoelectric equipment? There's a low-priced experimental set—consisting of photoelectric cell and relay, light source with infra-red filter, and signal-switchboard—with which you can determine whether the applications you've thought of are feasible. Rehtron Corp., 2159 Magnolia Ave., Chicago.

● NUMBERING PLIERS mark steel, brass, plastics, fiber, wood and other materials, for stock record purposes. They can be adjusted to a variety of diameters, and the single number wheel can be engraved with letters or figures from 3/32 to ¼ inch, to mark tubes, rings, bars, parts. H. O. Bates, 251–57 North Broad St., Elizabeth, N. J.

● THREE BOOKLETS on plant buildings and working environment have just been issued: "Lowering Costs Through Better Factory Design," $1; "Lighting and Air Conditioning for the Modern Plant," 75¢; "Effects of Environment and Atmospheric Conditions on Workers," 75¢. American Management Association, 330 West 42nd St., New York.

● LOCK PROTECTION SYSTEM changes locks without installing new ones. The locks have interchangeable cores which can be removed with a control key, adjusted to a new key combination and replaced, or interchanged with new cores of new combination. Best Universal Lock Co., Inc., 730 East Washington St., Indianapolis.

● BOOKLET tells how 16-mm. sound motion picture equipment can be used to convey information from management to personnel, or personnel to management. The Berndt-Maurer Corp., 117 East 24th St., New York.

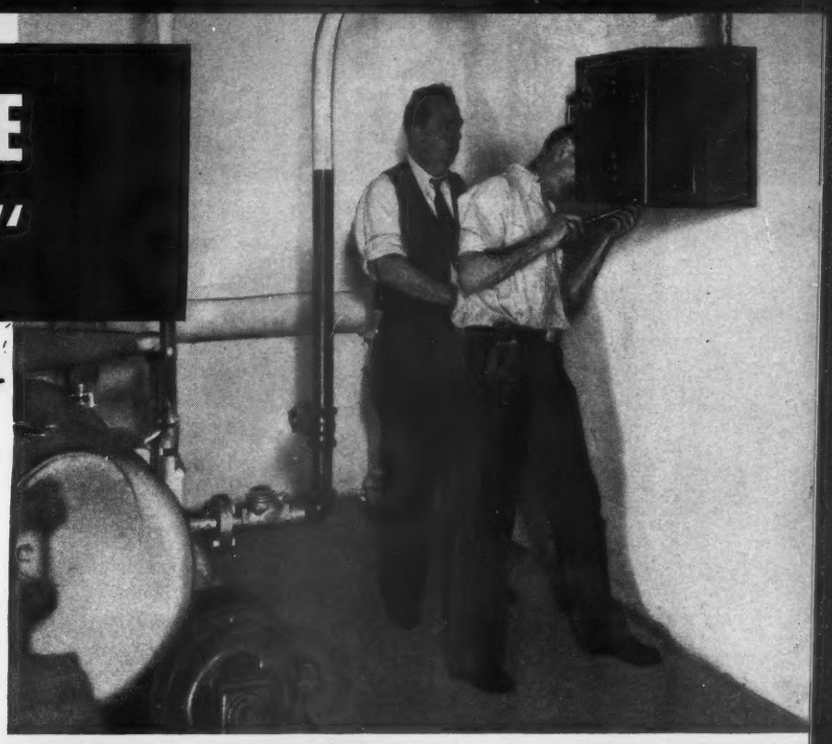
YOU WON'T run up overtime expense on long-distance telephone calls if you heed the Tele-Trol's 15-sec. warning bell to finish your conversation. Touch of the lever starts the device timing your call. Pointer shows time consumed. Holcomb & Swenarton, 92 Liberty St., New York

● PENCIL-LIKE MAGNET for removing metal fragments from eyes and surface wounds is said to be more powerful than earlier permanent magnets used for this purpose. Made of sintered alnico, it has a high permeability insert of nickel iron to collect the lines of flux at the point. General Electric Co., Schenectady, N. Y.

● WELCOME to plant operators should be a comparator set that enables them to determine soluble phosphate content of boiler water in a few minutes time, and to control it between desired limits. No strong acids are necessary, and no boiling; furnished with two control standards: 30-60 parts per million. W. H. & L. D. Betz, 235 West Wyoming Ave., Philadelphia.

● OUTER SHELL of the much publicized "Time Capsule" at the New York World's Fair was made of Cupaloy, an alloy designed to endure through the ages. Now comes Cuferco, a member of the

HE REALIZES THE IMPORTANCE OF "IC"



That's Why He's Installing G-E Air Circuit Breakers on All Branch Circuits

BESIDES adequate interrupting capacity ("I C"), G-E air circuit breakers provide overcurrent protection, with adjustable time delay. And you can restore service at once, safely, just by turning a handle. By providing three-phase interruption, single-phasing of motors, with all its harmful effects, is prevented. Because of their trip-free action, these circuit breakers cannot be held closed against short circuits. They are designed for interrupting ratings up to 80,000 amp.

For Main Circuits He Bought G-E Air Circuit Breakers Assembled as a Completely Enclosed Switchboard

This assembly of G-E air circuit breakers is installed as a unit. All you need do is to connect the leads. Being completely dead-front, it offers the advantage of safety over old-fashioned boards that have exposed live parts.

"I C" = Interrupting capacity

THE severity of a short circuit depends largely on the capacity of the transformers that feed the circuits and it can *not* be determined by the normal load on the circuit. As plant loads have grown, transformer capacities have been materially increased. Therefore, short circuits present an ever-increasing hazard. They gravely endanger personnel and property wherever the power supply has outgrown the interrupting capacity ("I C") of the protective devices. Are you sure of your "I C"? With G-E air circuit breakers of *known* interrupting capacity, you *can* be sure.

GENERAL ELECTRIC

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GET A BRIGHTER, SMOOTHER MORE UNIFORM COATING WITH TOLHURST CENTRIFUGAL GALVANIZERS

Equally effective for tinned or galvanized parts

TOLHURST CENTRIFUGALS

Tolhurst Centrifugal Galvanizer enables you to "spin off" excess spelter from batches of small parts in as little as 2 seconds time! Threads and holes come out clean and smooth. You can regulate the thickness of the coating by simply adjusting the accelerating rate. "Slingings" are recovered and returned to the kettle. Ideal for high tonnage, quality production on nuts, bolts, stampings, hardware, pipe fittings, etc. WRITE for complete information on production costs and prices. Use the convenient coupon below!

BASKET FOR ZINC BATH AND CENTRIFUGAL — Removable, perforated basket for carrying parts through zinc bath. Fits right into centrifugal for spinning off excess spelter.

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Tolhurst Centrifugal Division
American Machine and Metals, Inc., East Moline, Illinois

FILL IN — MAIL TODAY!

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YES! Send me complete data on the time saving advantages of TOLHURST CENTRIFUGAL GALVANIZER.

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Cupaloy family, but with greater strength, higher heat resistivity, more mechanical endurance, and lower electrical conductivity. Westinghouse Electric & Mfg. Co., East Pittsburgh.

• BLUE PASTE for locating high spots when scraping bearing surfaces, does not dry out, eliminating necessity for night clean-up and morning re-bluing. It stays "wet" for months, it is claimed, and can be left on master or bearing surface day in and day out. The Dykem Co., 2301 North 11th St., St. Louis.

• LAMP that fits standard socket gives 40, 60, and 100-watt light. Turn of collar at lamp base makes the changeover. Jewel Incandescent Lamp Co., 900 Passaic Ave., East Newark, N. J.

TRICKY INKSTAND enables draftsman to fill his ruling pen with one hand. By pressing the lever with little finger of his pen hand, he lifts filling loop clear of the bottle, where he can easily touch his pen nibs to it. Special stopper locks bottle tightly closed for the night. Eugene Dietzgen Co., 2425 Sheffield Ave., Chicago

• WHERE more expensive heat controls are unwarranted, a chemically treated paper finds use in indicating temperature rise above a given point. Made for controlling many temperature limits, it warns by changing from white to blue. Nashua Gummed & Coated Paper Co., Nashua, N. H.

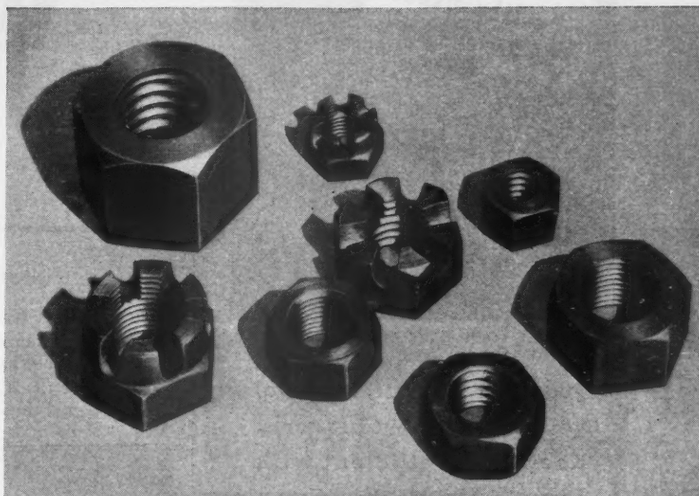
• "PICKLE POLISH," an electrolytic bath for stainless steel, finds use where it is desirable to impart a bright finish to small articles of intricate design. Immersion removes oxide scale, welding discolorations, and shear burr. The American Rolling Mill Co., Middletown, Ohio.

• ABRASION-RESISTING floor and dado enamel, available in 22 colors, dries overnight and leaves walls and floors with a washable, glossy finish. Baer Brothers, 438 West 37th St., New York.

• STERILIZATION of toilet seats is accomplished by means of germ-killing rays of Westinghouse Sterilamp. After use, the seat rises automatically to vertical position, fits into its sterilizing unit, is sterilized. Can be installed on existing plumbing fixtures. Sterilseat Sales Corp., 225 South 15th St., Philadelphia.

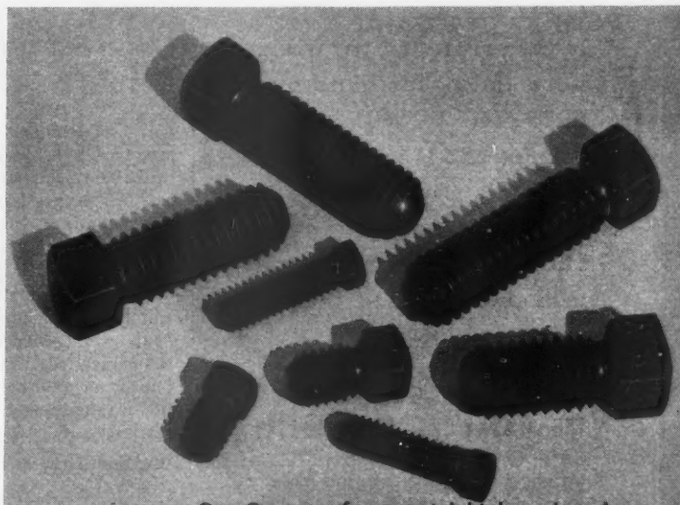
YOU CAN GET EVERY *Fastening* YOU NEED HERE

Milled and rough Studs are stocked in popular sizes. When physical requirements and raw materials are specified, made to order in production quantities of carbon or alloy steel, or non-ferrous alloys, from ¼-inch to 1½-inch diameters, any length.



As one of the largest producers of nuts, we supply Semi-Finished, Castle, Slotted, Cold Punched, Hot Pressed, Cold Forged, Stove Bolt and Machine Screw Nuts in any quantity from stocks. We make nuts from non-ferrous alloys to specifications.

Lamson full finished Cap Screws of SAE 1020 steel have approximately 90,000 lbs. per sq. in. *minimum* tensile strength. Our high carbon cap screws of SAE 1035 steel, heat treated, have approximately 150,000 lbs. *minimum* tensile strength.



Lamson Set Screws of a special high carbon heat treated steel compare favorably with much higher priced alloy steel set screws in performance. Cost you no more than common low carbon set screws available heretofore.

● *Regardless of what kind* of fastenings you need, you can get them all from Lamson & Sessions, because we manufacture the most complete line of bolt and nut products in this country. *Regardless of the size* of your order, Lamson & Sessions can fill it completely and quickly, because our five plants maintain their own warehouse stocks as well as supplying a nation-wide network of responsible jobbers. It is an obvious economy of time, effort and expense to order every kind of fastening you need—*in one shipment, at one time, on one invoice, from one manufacturer.* Specify Lamson products for *dependable quality* maintained year after year—and *dependable service* in supplying your needs at all times.

●

THE LAMSON & SESSIONS CO., Cleveland, Ohio

75th ANNIVERSARY 1865-1940

Your Jobber stocks the Lamson line

LAMSON & SESSIONS

BOLTS • • NUTS • • COTTERS • • CAP SCREWS • • SPECIALS

Your employees' hands are your firm's most valuable, yet most vulnerable tools. Keep them efficient with Formula SBS-11, the safe industrial skin cleansing soap that removes grease and grime. Its high bacteria removal power helps prevent dermatitis. 3410 firms use it exclusively. Costs less than 1¢ per employee per week. Write today for generous FREE TRIAL SUPPLY of Formula SBS-11 to Sugar Beet Products Company, 300 Waller Street, Saginaw, Michigan, or cut off, sign and mail the attached coupon.

Formula SBS-II
THE WASHWORD OF INDUSTRY

MAIL THIS COUPON NOW

Sugar Beet Products Co.
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Saginaw, Michigan.

Please send us a free trial supply of Formula SBS-11 prepaid and without obligation.

Firm .....

Address .....

City..... State.....

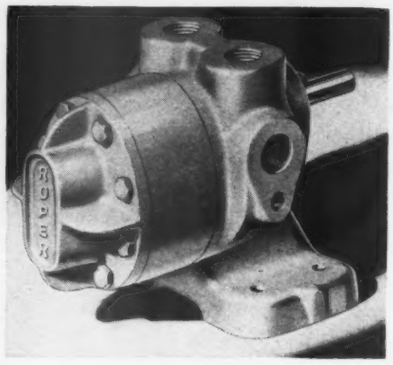
Signed .....

We Have.....Employees
(Number)

What's New in Equipment

Rotary Pumps

Outstanding feature of new line of pumps is "hydraulic balance" incorporated to equalize internal pressure and absorb shock or thrust from power end of drive shaft. Containing over 7,000 units, this



new line includes pumps having capacity range of 1 to 1,000 g.p.m., at speeds up to 1,800 r.p.m., and against pressures up to 1,000 lb. per sq. inch. Range of drives and mountings covers foot, hub, and flange mounting heads; bedplate units for direct motor drive; gear reduction; flat or V-belt drive. Other features include choice of spiral, spur, or herringbone gears; packing box, spring-loaded packing box, or mechanical seal; sleeve or roller bearings; built-in or external relief valve; eight piping arrangements. Geo. D. Roper Corp., Rockford, Ill.

Wall Fans

Aluminum-alloy wall fans range in diameter from 12-36 in., and 42-48 in., and employ 4- and 6-blade propellers respectively. Motors range from 1/40 to 7½ hp. and have a maximum capacity of 40,000 cu.ft. of air per minute, it is said. They are available for single and variable speeds and may have horizontal or vertical mountings. Speeds of larger fans range from 340-860 r.p.m. and the smaller ones from 715-1,750 r.p.m. The fans can be supplied with guard and automatic shutters. The frames and blades are each cast in one piece and the wheel is mounted directly on the motor shaft. Truflo Fan Co., 519 Main St., Harmony, Pa.

Speed Transmission

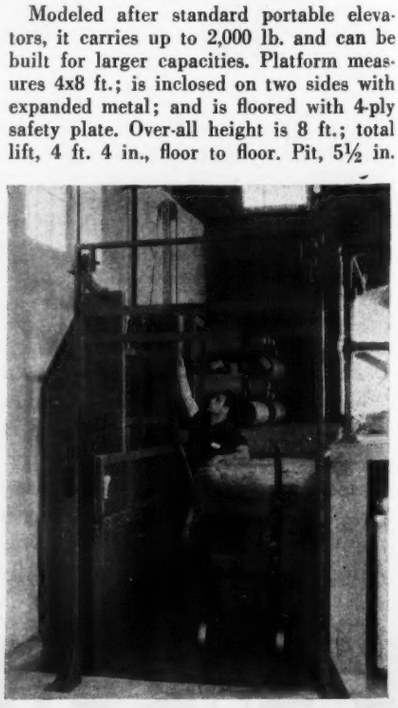
Four speed transmissions, for application to cone-driven machine tools, come in three models: Master, for 1-5 hp.; Major, for 5-10 hp.; Super, built to specifications for machines requiring larger than 10-hp. motors. Built for heavy loads with the transmission case and covers of semi-steel castings, and the gears and spline shafts of alloy steel. Moving parts run in an oil bath; revolving shafts are mounted on anti-friction bearings. (Oil seals are provided where necessary). The four selective speed changes (forward and reverse) are: 1:1, 2:1, 3:1, and 4:1. The transmissions come complete with brackets which provide for motor and attachment to machine. Western Mfg. Co., 3428 Scotten Ave., Detroit.

Limit Switch

LK-2 limit switch, for actuation by rotating or sliding cams, has a roller actuator that is adjustable through an arc of 225 degrees. Features claimed: Single-pole switching element—normally open, normally closed, double-throw contact arrangements; movement differential at the roller of 0.002 in.; pre-travel of 1 deg.; over-travel of 20 deg.; operating pressure of less than 1.8 lb.; interchangeability; resistance to oil and water. Rated at ½ hp. up to 460 volts a.c. Micro Switch Corp., Freeport, Ill.

Stationary Lifter

Modeled after standard portable elevators, it carries up to 2,000 lb. and can be built for larger capacities. Platform measures 4x8 ft.; is inclosed on two sides with expanded metal; and is floored with 4-ply safety plate. Over-all height is 8 ft.; total lift, 4 ft. 4 in., floor to floor. Pit, 5½ in.



"WE'LL TAKE A CARLOAD ...OF LO-MAINTENANCE MOTORS!"

Famous Manufacturer Chooses Lo-Maintenance Motors Because of Record-Breaking Performance. Here's the Story of How You Can Protect Your Production from Motor Crack-ups . . . with Allis-Chalmers Lo-Maintenance Motors!

Another true case history from the Allis-Chalmers files that proves **"IT PAYS TO BUY THE EQUIPMENT THAT PAYS FOR ITSELF!"**

WHEN YOU BUY your motors by the carload — 346 of them of the same make — you've got to have ***more*** than just confidence in the company that builds those motors. You've got to have proof . . . definite proof . . . that those motors will give you ***extra*** years of continuous service at the lowest possible cost!

That's the kind of proof Warner Automotive Parts Division of Borg-Warner Corporation wanted when they went out to buy motors for their new plant at Auburn, Indiana. So they checked motor performance in their other plants . . . got facts and figures on how motors were operating.

Here's What They Found!

They made one important discovery! In the part of their plant where conditions many times wrecked ordinary motors in short order . . . Allis-Chalmers Lo-Maintenance Motors had run perfectly for years . . . without breaking down . . . without running up expensive repair bills!

That's why they came to Allis-Chalmers for that carload order . . . standardized on Lo-Maintenance Motors in their plant! And that's why Lo-Maintenance Motors have become standard equipment in thousands of plants that want motors that give ***more*** than just a rated horsepower.

Remember, Allis-Chalmers builds Lo-Maintenance Motors with high carbon steel frame . . . indestructible rotor and distortionless stator . . . exclusive husky, all around construction with no skimping on materials — your guarantee of ***added*** protection against motor crack-ups!

By all means investigate Lo-Maintenance Motors! See how they work . . . see how they can save money in your plant! Call the nearest Allis-Chalmers district office . . . or write for Bulletin 1195.

SOME OF THE 346 ALLIS-Chalmers Lo-Maintenance Motors installed in 1938 in the new Auburn, Indiana, plant of the Warner Automotive Parts Division of Borg-Warner Corporation. Equipped with Allis-Chalmers Texrope Drives for driving gear-making machines, they are in almost continuous operation . . . do not break down even when cutting tool stalls or overloads them.

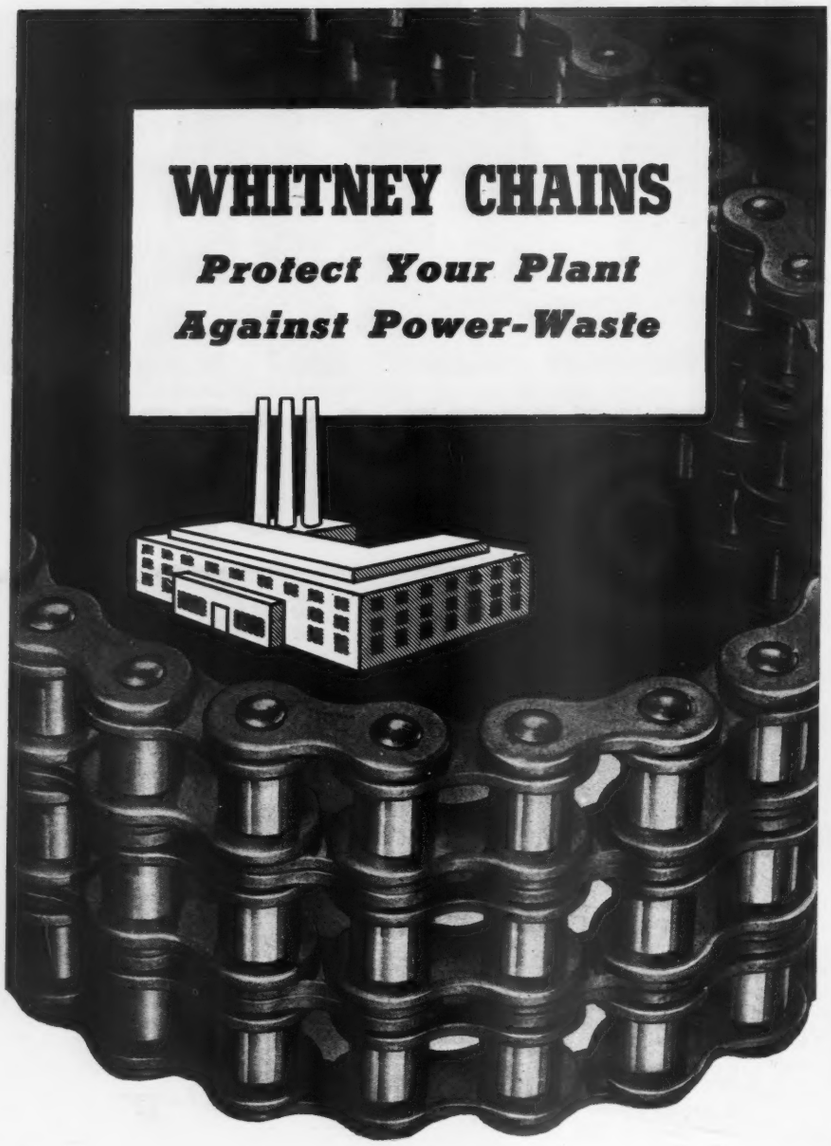
HERE'S A TIP! When you choose new machines for your plant, ask the manufacturers to equip them with Lo-Maintenance Motors. There'll be no extra charge!

A 1188

Over 90 Years of Engineering Superiority Work for You When You Specify Allis-Chalmers!

ALLIS-CHALMERS

MILWAUKEE · WISCONSIN



FORTIFY your plant against loss of power on production drives. Keep your machines up to top-capacity, and get your full quota of production . . . uniform in quality . . . day after day. For when you get the *constant factor* of Whitney Chain efficiency on every power drive, you'll save all along the line. And Whitney's long life and uninterrupted operation mean lowest chain costs in the long run. *Write for Catalog V-115B.*

The Whitney Chain & Mfg. Co., Hartford, Conn.

WHITNEY CHAINS

WHITNEY PRODUCTS

Roller Chain & Sprockets, Silent Chain & Sprockets, Conveyor Chain & Sprockets, Roller Chain Flexible Couplings, Automatic Load Limiting Sprockets, Automatic Drive Tensioners, Universal Chain Vises.

deep, permits the platform to lower exactly flush with the floor. Two safety gates—one follows up with the load while the other automatically lowers, barring the opening under the platform. Machine is powered with a 3-hp. electric motor lifting at 35 ft. per minute. Twin roller chains are used. In operation, the truck is rolled on the platform; the operator pulls the control cable; and the platform glides up to storage platform level and stops automatically. The Service Caster and Truck Co., Albion, Mich.

Hose for Butane-Propane Gas

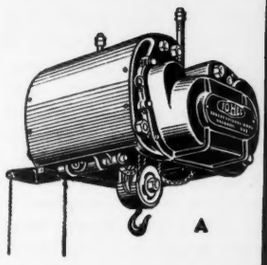
Combination construction of the hose features a synthetic tube and rubber cover to protect against destructive action of gases and to withstand pressures used.

Sizes range from ⅜ to 3 in. in diameter. Sizes ½ inch and larger have built-in static wire. Uses: ⅜ in.—chiefly in short lengths between storage tank regulator and permanent piping; ½ and ¾ in.—as discharge hose for liquefied gas from delivery trucks to customer's containers; ¾ and 1 in.—as return lines between tank cars, storage tanks, and delivery trucks, as a vent for vapor above liquid level to maintain balanced pressure necessary to fill receiving container; 1¼, 1½, 2, and 3 in.—as conveyance for liquefied gas from plant storage to tank car, from tank car to local storage, and to delivery trucks. The B. F. Goodrich Co., Akron.

Fluorescent Lamps

Model 5000, for bench or wall mounting, can be screwed or bolted to any surface. Arm extension: 24 inches. Model 5002, for bench mounting, has a screw-on arm holder. Extension: 26 inches. Model 5005, for wall mounting, has an extension of 40 inches. Model 5003 floor lamp has an 11-in. heavy cast base. Arm extension: 26 inches. Height of standard: 40 inches. Model 5004 file or desk lamp is equipped with a 9-ft. cord and rubber spring plug. Extension: 24 inches. Single-tube type suspended fixture for 18-, 24-, 36-, and 48-in. tubes operating on from 110-220 volts, 60 cycles, a.c. or d.c., finds use at work tables, printing plants, color matching. Model 5001, for average-size

GET the hoist with every *worthwhile* feature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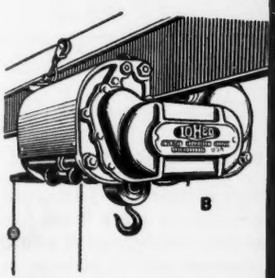
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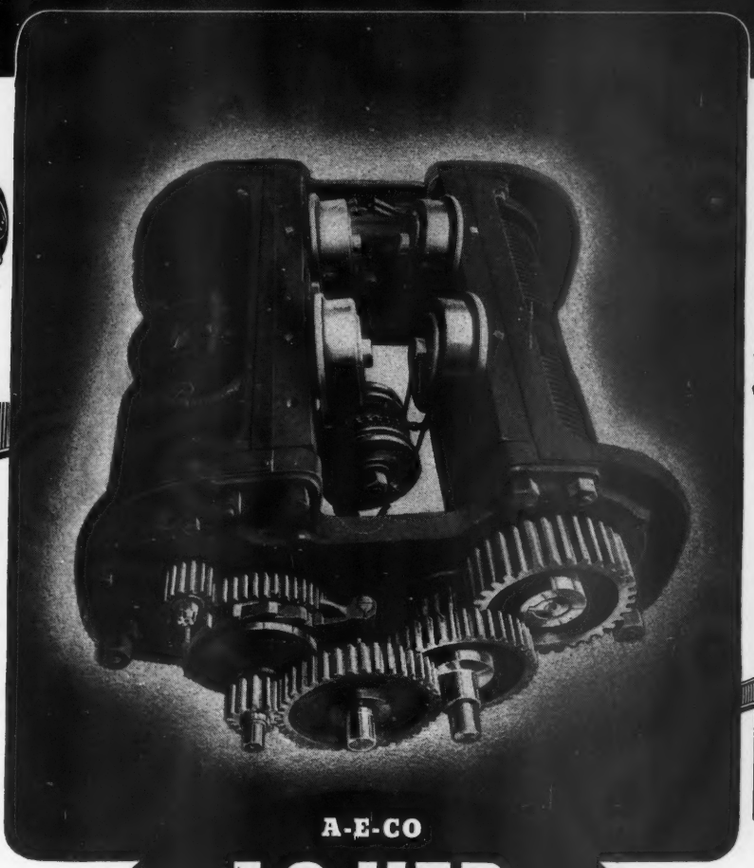

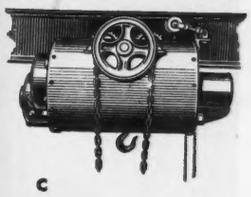
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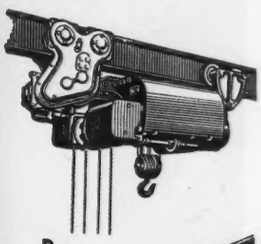
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E

THERE'S A LO-HED ELECTRIC HOIST FOR EVERY PURPOSE

A—Bolt Suspension Type.
B—Plain Trolley Type.
C—Hand-Geared Type.
D—Motor Driven Trolley Type.
E—Cab-Controlled Type.

CAPACITIES FROM ¼ to 12 TONS

A-E-CO

LO-HED *Time-tested* HOISTS

When you buy an electric hoist you want all the *worthwhile* features a hoist should have. Here is the way to get them: specify LO-HED. Lo-Hed construction includes *every* feature that the test of time has proved desirable. A-E-CO engineers have successfully resisted every temptation to add gadgets which would only have provided mere "talking points" or "improvements" which would not better performance, life, efficiency, or maintenance. Note in the open-view of the Lo-Hed Hoist the logical arrangement of the hook between the drum and motor for minimum headroom. And these time-tested features: heavy duty hoist motor, automatic lowering brake, automatic bearings, stub shafts, grooved drum, plow-steel cable, 100% positive automatic stop, fire, dust and moisture-proof controller. (Construction varies slightly for classes of Lo-Heds.) • Investigate Lo-Hed time-tested construction. Write today for the complete Lo-Hed Catalog, shown below.

AMERICAN ENGINEERING COMPANY

2426 **ARAMINGO AVENUE, PHILADELPHIA, PA.**

OTHER A-E-CO PRODUCTS: TAYLOR STOKERS, MARINE DECK AUXILIARIES, HELE-SHAW FLUID POWER

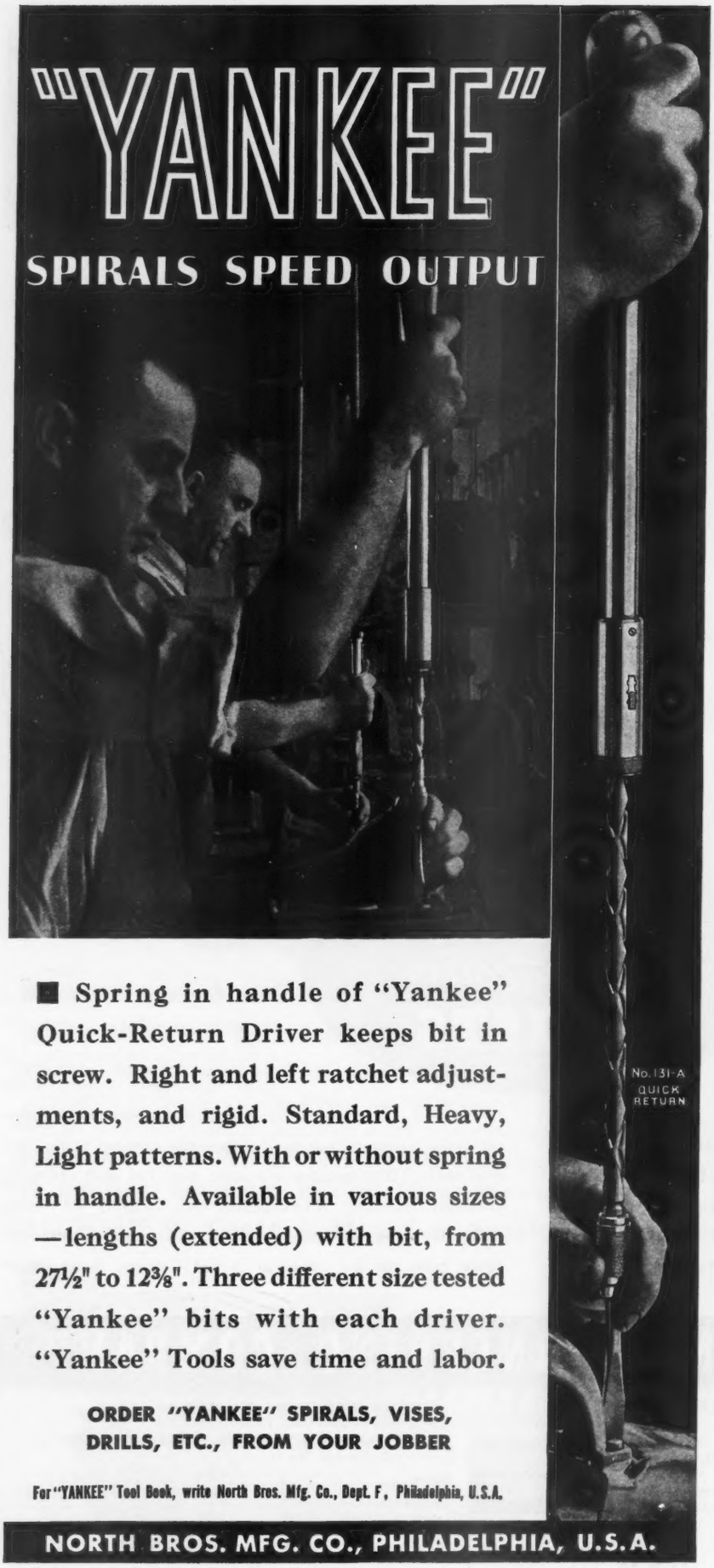
Classified phone directories list the local A-E-CO representative in principal cities. Call him in . . . or write us for the hoist catalog.

MAIL THIS COUPON NOW

AMERICAN ENGINEERING COMPANY
2426 Aramingo Avenue, Philadelphia, Pa.

☐ Please send me your 26 page complete catalog of Lo-Hed Hoists.
☐ Ask your representative to call.

Name_____
Company_____
Street Address_____
City_____ State_____
(Please print plainly)



■ Spring in handle of "Yankee" Quick-Return Driver keeps bit in screw. Right and left ratchet adjustments, and rigid. Standard, Heavy, Light patterns. With or without spring in handle. Available in various sizes—lengths (extended) with bit, from 27½" to 12⅜". Three different size tested "Yankee" bits with each driver. "Yankee" Tools save time and labor.

ORDER "YANKEE" SPIRALS, VISES, DRILLS, ETC., FROM YOUR JOBBER

For "YANKEE" Tool Book, write North Bros. Mfg. Co., Dept. F, Philadelphia, U.S.A.

NORTH BROS. MFG. CO., PHILADELPHIA, U.S.A.

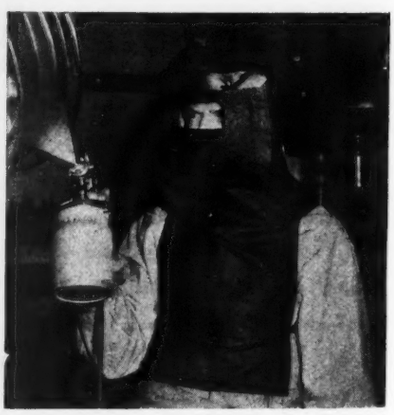
drafting boards, has an arm length of 24 inches. Bracket holds drafting board cover. Model 5001-A, for larger drafting boards, is similar to 5001 but is also equipped with a 5-in. upright spindle and 12-in. extension arm. Extreme extension is 36 inches. Van Dyke Industries, 2857 South Halsted St., Chicago.

Air-Conditioning Equipment Control

Magnetic switch for control of air-conditioning equipment motors, operates directly from the contacts of a room thermostat or other low-voltage control instrument. It consists of a 3-pole magnetic switch mechanism, overload relays, low-voltage-control transformer, assembled in one unit. Low-voltage-control terminals on outside of inclosure assure complete isolation of pilot circuit from power wiring. A normally open interlock is furnished to provide correct sequencing with other equipment when desirable. The operating coil is isolated electrically from the power circuit. General Electric Co., Schenectady, N. Y.

Revolving Joints

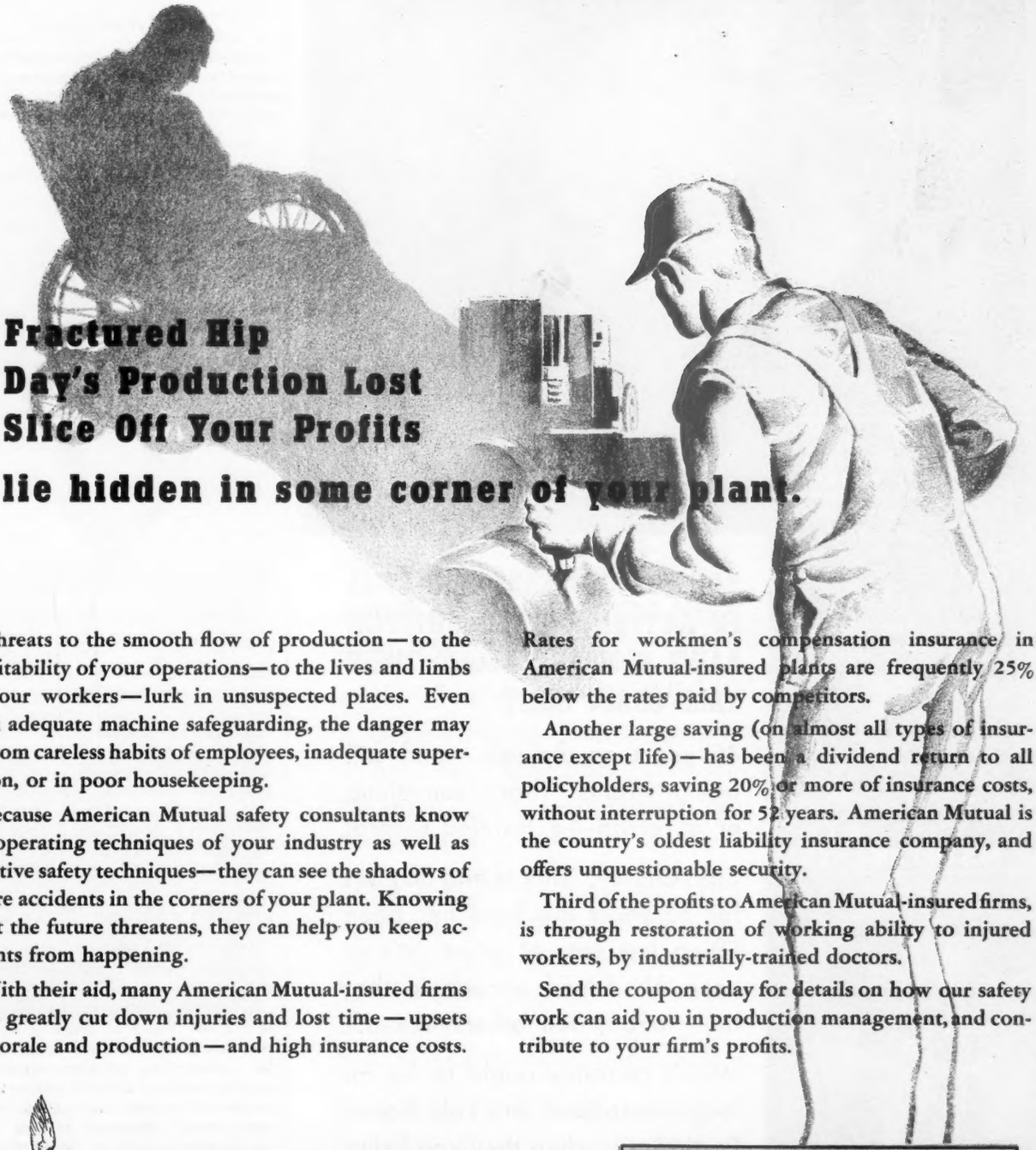
Revolving-type, flexible ball joints, used to supply steam, gas, or other fluids from a fixed or stationary supply pipe to a rotating drum or member without leakage, are said to provide free movement in all directions. The rotating sleeve constitutes the revolving part. It slides in and out to take care of any end play in the revolving drum. The double-ball design provides compensation for any slight misalignment of movement. An adapter can be used to feed two different fluids into the revolving drum, or syphon out condensate through the same opening. Barco Mfg. Co., 1801-1815 Winnemac Ave., Chicago.



Spraying Hood

Paint-spray hood, made of black, rubberized fabric and equipped with a sweatband, affords protection from dust. Air supply is conducted through a flexible hose attached to the operator's belt and running to a metal tube set in the crown. Twenty-four vents permit the air to flow over the operator's face and out through the opening in front of his eyes, thus keeping fumes and dust away. The open-

"Coming Events Cast Their Shadows"



A Fractured Hip
A Day's Production Lost
A Slice Off Your Profits

lie hidden in some corner of your plant.

Threats to the smooth flow of production—to the profitability of your operations—to the lives and limbs of your workers—lurk in unsuspected places. Even with adequate machine safeguarding, the danger may be from careless habits of employees, inadequate supervision, or in poor housekeeping.

Because American Mutual safety consultants know the operating techniques of your industry as well as effective safety techniques—they can see the shadows of future accidents in the corners of your plant. Knowing what the future threatens, they can help you keep accidents from happening.

With their aid, many American Mutual-insured firms have greatly cut down injuries and lost time—upsets of morale and production—and high insurance costs.

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Send the coupon today for details on how our safety work can aid you in production management, and contribute to your firm's profits.

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American Mutual and its affiliate offer opportunity for savings on Automobile, Fidelity Bond, and practically all other lines of casualty insurance, in addition to Workmen's Compensation.

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Dept. L-3, 142 Berkeley St., Boston, Mass.

Please send me without obligation, your free booklet, "Three P's of Safety."

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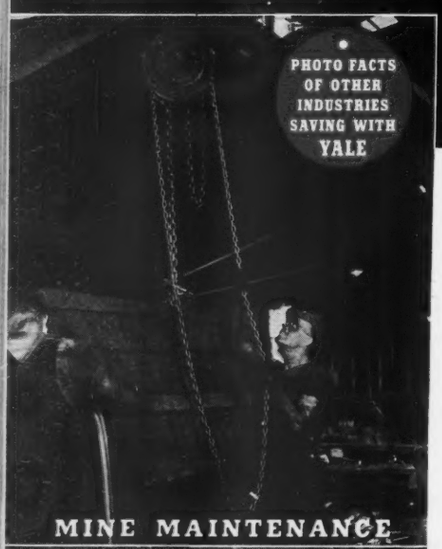
Surplus to Policyholders: $6,509,269.42

BRANCHES IN 59 OF THE COUNTRY'S PRINCIPAL CITIES



"ON JOB 35 YEARS AND STILL IN ACTION," SAYS CHILTON PAINT COMPANY ABOUT THEIR YALE CHAIN HOIST

35 years on the job—and still going strong! That's something of a record—a *testified* record.

Says Chilton, "Day in and day out for 35 years this hoist has been lifting ton vats of paint. We've probably saved enough in that time to buy ten others like it."

Which certainly ought to be an incentive to look into Yale hoists. Particularly when they can bring you exactly the same sort of service. Contact your local Yale distributor. He has the facts at his fingertips.

YALE

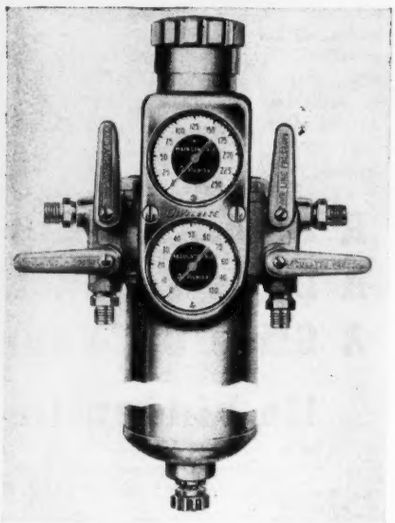
THE YALE & TOWNE MFG. CO.
PHILADELPHIA DIVISION, PHILADELPHIA, PA., U. S. A.
IN CANADA: ST. CATHARINES, ONT.

Makers of Yale Hand Chain Hoists, Electric Hoists, Electrical Industrial Trucks, Hand Lift Trucks and Skid Platforms.

ing is cut in the black fiber unit which can be removed and replaced by a unit fitted with a plastacele window measuring 6½ x 9¾ inches. Jackson Electrode Holder Co., Detroit.

Air Transformers

Type HLC air transformer has been designed to feed clean moisture-free air at uniform regulated pressure to the spray gun. It is said to handle over 50 cu.ft.



of air per minute with a minimum of pressure drop and to pass air for two production spray guns in continuous and simultaneous operation or for three spray guns in ordinary intermittent production use. Construction: synthetic rubber regulator diaphragm; regulator knob; condensing chamber; air-cleaning baffle; mechanical filtering device and metal filter that eliminates cotton waste pack; inclosed pressure gages; and die-cast body. The cylinder is chromium plated and polished. The DeVilbiss Co., Toledo.

Pressure and Low Water Control

Type DA-131Q combination pressure and low water control is used for the protection of low-pressure automatically fired steam boilers against the hazard of firing into a dry boiler or building up excess pressure. Features: Hook-up attachments for installation; packless construction: seal by means of a metal bellows; double outside adjustments for setting the pressure range; mercury inclosed contact switch that is said to be unaffected by dust, dirt, or corrosive gases. Range—adjustable from 0-10 lb.; electric capacity—10 amp. 115 volts, 5 amp. 230 volts; motor rating—1 hp. repulsion induction, 1 hp. split phase or d.c. The Mercoid Corp., 4201 Belmont Ave., Chicago.

Leather Link Belt

Each link of the Duplex belt is made from two plies of leather to provide a link that wears evenly. The rough sides of the single links are bonded together

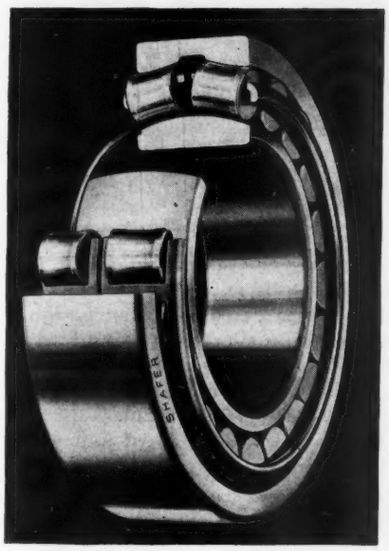
with the grain of the leather outside. These double-ply links are bored and joined together with steel connecting pins, and the ends of the bores are countersunk thus protecting the butted end of the connecting pin and enabling the belt to run against the pulley flange with safety. The belt is designed for slow, heavy-pull drives where slippage is required and can be operated on comparatively small pulleys with an idler at relatively short centers, it is claimed. Alexander Brothers, Inc., 406 North Third St., Philadelphia.

Fluorescent Lighting Units

Flu-O-Flector lighting unit is available in two sizes—for two or four 48-in. lamps. The four-lamp size is said to provide in excess of 110 foot-candles of light 4 ft. from the unit. Equipped with Alzak reflector, high-power-factor ballasts, removable starter switches, and non-radio-interference starting compensator. The Edwin F. Guth Co., 2615 Washington Ave., St. Louis.

Double-Row Roller Bearings

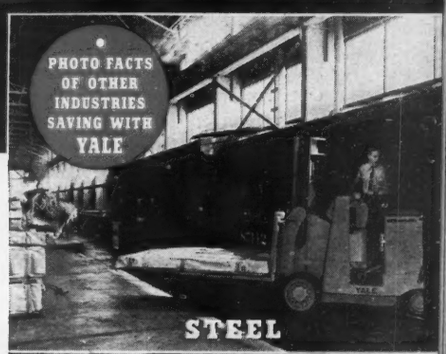
Series DE 200 and DE 300 self-contained double-row roller bearings come in sizes from 3.1490- to 5.9045-in. bore and 1.9680- to 5.1171-in. bore, respec-

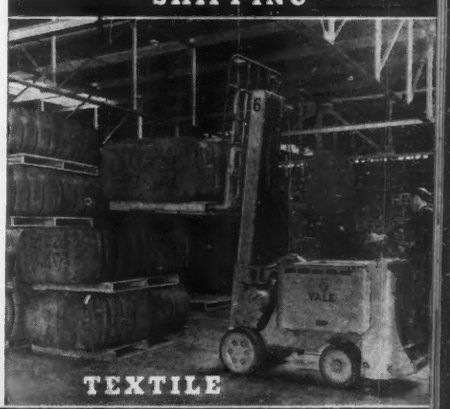


tively. Rollers operate between convex races, the 1-piece outer race having two ground raceways. The concave design provides self-alignment within the bearing and capacity for radial loads, thrust loads in either direction, or any combination of radial and thrust loads, it is said. Thrust capacity is provided through the shape and position of rollers and races without auxiliary means of taking thrust. Shafer Bearing Corp., 35 East Wacker Drive, Chicago.

Tires and Wheels

Doenut tires feature a valve placed outside the rim and not in contact with the rim. The short flexible rubber valve stem is located so as to be free from





"CAR UNLOADING TIME REDUCED OVER 85% BY ONE YALE ELECTRIC TRUCK,"

*Says Huge Glass Company.**

85% saved in car unloading time—and only one truck does it! Sounds incredible—but here's the *testified* fact.

Says the company involved, "Formerly this particular job took 32 hours to complete. Now, our Yale Electric Truck cuts the time to two and a half hours—saves us $18 on every carload handled!"

Supposing you could cut your handling costs that way too—wouldn't it be something worth investigating? Well, you can! Call our nearest representative. He'll tell you how.

**Name on request*

THE YALE & TOWNE MFG. CO.
PHILADELPHIA DIVISION, PHILADELPHIA, PA., U. S. A.
IN CANADA: ST. CATHARINES, ONT.

YALE TRADE MARK

Makers of Yale Hand Chain Hoists, Electric Hoists, Electrical Industrial Trucks, Hand Lift Trucks and Skid Platforms.

PREMIUM PULLING POWER COUNTS MOST... AND COSTS LESS WITH Dayton COG·BELTS

COOLER RUNNING DAYTON V-BELTS with Daytex Cord *do* "carry the mail" at top speed, but since it's the extra power that counts most, we are prepared to prove that Daytons stand up under constant high speed flexing to give you premium pulling power at lower cost.

It took a long time (seven years, in fact) for Dayton's famed technical laboratories to develop Dayton V-Belts with Daytex Cord in their neutral axis section. But it was time well spent!

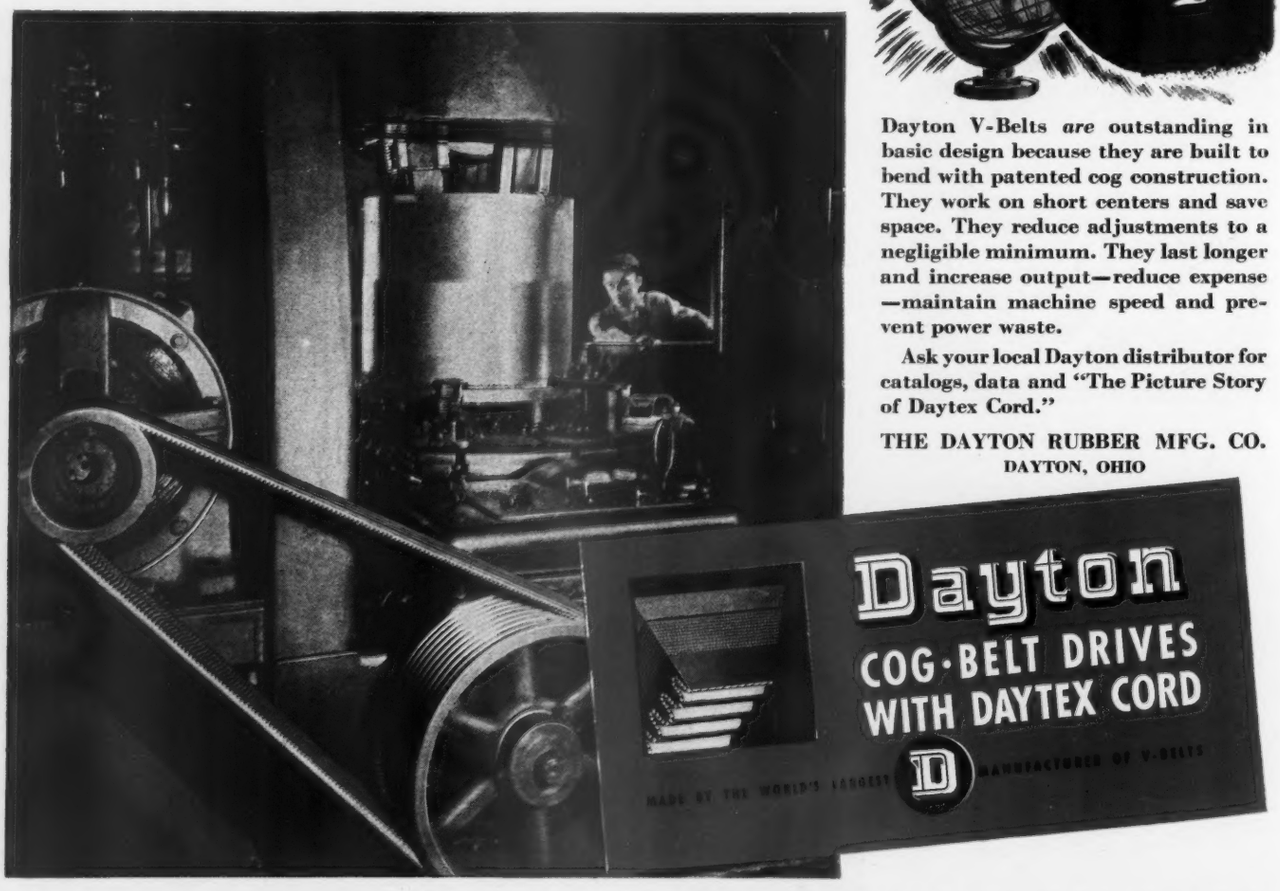
Exhaustive laboratory tests first proved that Daytex Cord has less stretch, longer life and greater strength than the best comparable cord *not* Daytex processed.

But Daytons' ability to *consistently* deliver premium pulling power at less cost per day, has been proved beyond question by countless field applications of every conceivable type—under all conditions—in all climates and places—in all types of industries.

Dayton V-Belts *are* outstanding in basic design because they are built to bend with patented cog construction. They work on short centers and save space. They reduce adjustments to a negligible minimum. They last longer and increase output—reduce expense—maintain machine speed and prevent power waste.

Ask your local Dayton distributor for catalogs, data and "The Picture Story of Daytex Cord."

THE DAYTON RUBBER MFG. CO.
DAYTON, OHIO



rubbing or scraping damage. Punctures can be repaired without removing the tires from the wheels, it is claimed. The valve is said to eliminate damage caused by "creeping" from running tires under inflated. Three sizes: 10x2.75 in.; 12x3.30 in.; 16x4.40 inches. Musselman Products Co., 6276 St. Clair Ave., Cleveland.

Floodlight Projectors

Heavy-duty floodlight projectors, furnished with forged steel trunnion, are

available for installation with Thompson lamp-lowering hanger unit 1177. Features: Cast aluminum projector; sealed projector door and door glass joints; adjustable trunnion mounting provided with a locking device and register for returning to original position after servicing. Radial-angle adjustment is provided for in the adapter furnished with the hangers thereby making vertical and radial-angle adjustments possible at ground level. The projectors are available in a range of sizes with glass or Alzak reflectors, and plain-, rectangular-, circular-, or fan-type light-control lenses. The Pyle-National Co., 1334 North Kostner Ave., Chicago.

Paint-Spray Equipment

Line of paint-spray equipment includes spray guns, tank and portable compressor units, and a miniature paint-spray unit for touch-up work and general use. Compressors are of reciprocal piston type. The touch-up spray unit, complete with compressor, motor, spray gun, and hose, weighs 8 pounds. In addition to finishing and touch-up work, it can be used for spraying insecticides, fine oil, moth-proofing materials. Miller-Simons, Inc., 2900 South 61st Court, Cicero, Ill.

Circuit Breaker Panelboards

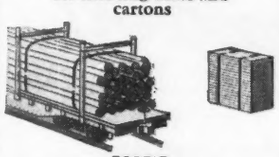
Nofuse De-ion circuit breaker panelboards are for use where the air is filled with chemical or acid vapors and are calibrated for use under oil. Suitable for indoor and ourdoor mounting, they have a thermal-trip breaker that insures constant tripping regardless of temperature change, it is said. Panelboards are constructed with 6-, 12-, or 24-branch poles

12½% FASTER with less effort

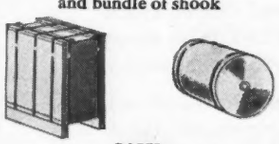
The Acme Steelstrap Process simplifies, economizes, guards the handling, packing and shipping of products FOR EVERY INDUSTRY

FOOD
Bracing pool cars and cheese drums

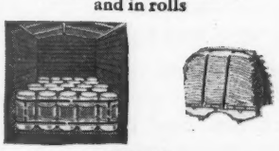
TEXTILES
Reinforcing bales and cartons



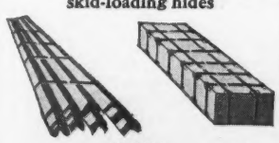
FOREST
"Packaging" car of poles and bundle of shook



PAPER
Protecting paper on skids and in rolls



PROCESS
Unit-loading drums and skid-loading hides



METALS
Bundling sheets and structural shapes

Doc. Steelstrap
increases shipping room output ECONOMICALLY

● By suggesting the "right" Acme tools and accessories, Doc. Steelstrap helped another manufacturer modernize a handling and shipping procedure—placed it on a production line basis—increased man-hour output without increasing effort. And at the same time obtained the Acme Steelstrap Process advantages of lower freight and material costs, fewer damage claims and elimination of pilferage losses.

The automatically seal-fed Acme Steelstrapper, being used above tensions, seals and cuts the steelstrap from the coil in a single stroke of two levers. One tool does the entire job. The Acme tool mount keeps the Steelstrapper within easy reach. The Acme coil tray suspended from the ceiling saves space, places strap for convenient, easy use.

Perhaps *your* strapping set-up can be engineered for better performance . . . and as a further means of stopping profit leaks beyond the production line. An Acme engineer will be glad to co-operate with you in determining the tools and arrangement which will assure faster, lower cost packing and shipping. Mail the coupon—there is no obligation. ACME STEEL COMPANY, 2831 Archer Ave., Chicago, Ill. Branches and Sales Offices in Principal Cities.

ACME Steelstrap PROCESS
FOR MAKING SHIPMENTS "BOUND TO GET THERE"

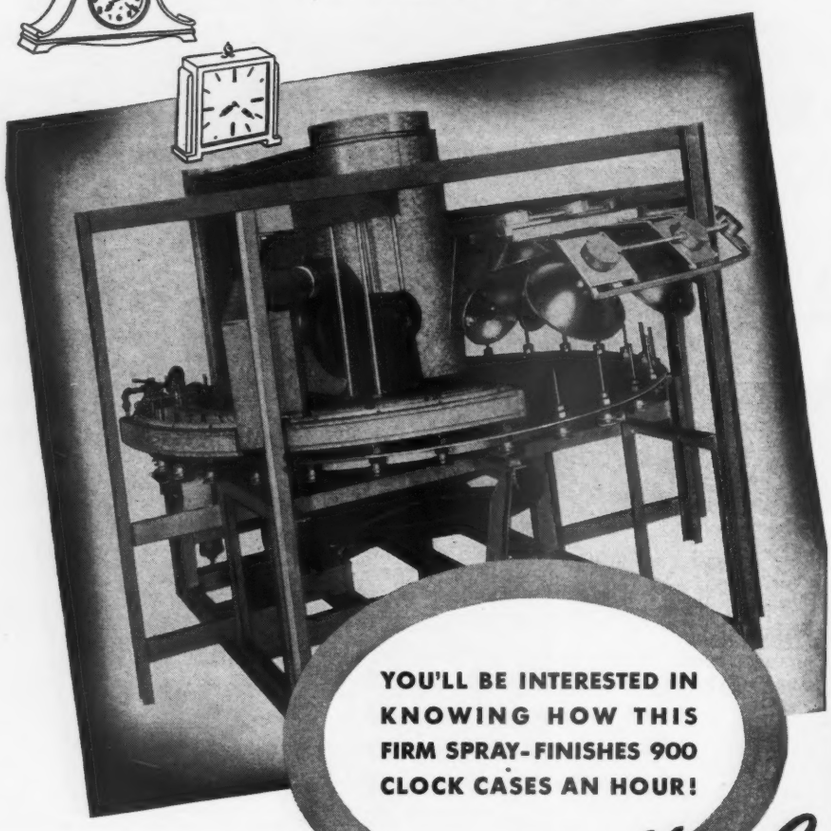
ACME STEEL COMPANY
2831 Archer Ave., Chicago, Ill.
( ) Have Acme engineer call.
( ) Mail a free copy of "Stopping Profit Leaks Beyond the Production Lines."

Name.....

Address.....

City.....*State*.....

YOU MAY NOT MAKE CLOCKS *but...*



YOU'LL BE INTERESTED IN KNOWING HOW THIS FIRM SPRAY-FINISHES 900 CLOCK CASES AN HOUR!

What's your Problem?

● Time is important in that plant. Its product measures time. Its costs are based on time. Saving time in spray-finishing odd-shaped clock cases was a problem—until a DeVilbiss Spray Specialist was called in for recommendations.

DeVilbiss Automatic Spray Equipment was the solution—and look at the amazing results that DeVilbiss engineers produced. Product finishing was increased to 900 clock cases an hour, the finish baked in an infra-red ray oven and hardened in a cooling tunnel—all within a floor space not much larger than the top of your desk.

This is just one of hundreds of spray-finishing problems that have been solved with most profitable results by the many specialized types of DeVilbiss Automatic Machines. Find out what they can do for you. Call the DeVilbiss representative today.

THE DEVILBISS COMPANY • TOLEDO, OHIO

Canadian Plant: WINDSOR, ONTARIO

THE COMPLETE DEVILBISS LINE CONSISTS OF: Spray-finishing equipment . . . Automatic coating machines . . . Tanks for spray materials . . . Spray booths and exhaust fans for vapor and dust elimination . . . Air regulators, cleaners and dusters . . . Air Compressors . . . Respirators . . . Specialized hose for paint, air, water, gasoline, welding and pneumatic tools . . . Hose connections . . . Water and oil guns . . . Equipment to prevent offset in printing . . . Paint stripers . . . Medicinal atomizers . . . Perfume atomizers.

DEVILBISS SPRAY SYSTEMS

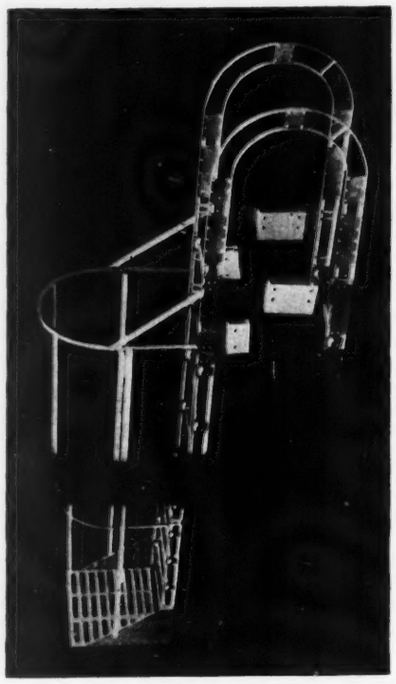
with a main bus capacity of from 50-400 amperes. The breakers are mounted on a micarta panel suspended by a frame from the head and can be removed or replaced from the front of the panelboard. Bus connections are at the rear of the panel; the live parts on the face are the main lugs or breaker terminals. Westinghouse Electric & Mfg. Co., East Pitts burgh.

Caster Unit Tire

Pneumatic tire, for use on a swivel-caster unit on industrial trucks, is a thick, heavy-duty, 10- or 12-in. six-ply tire with a smooth, narrow tread. Can be used on a heavy-duty caster-wheel unit in front of a truck with regular 18-, 20-, or 22-in. six-ply General industrial tires on the rear. General Tire & Rubber Co., Akron.

Overhanging Ladder

All-aluminum overhanging ladder, for use in repairing dams, bridges, buildings, is designed to fit over the top of a dam or wall and yet is held away from the

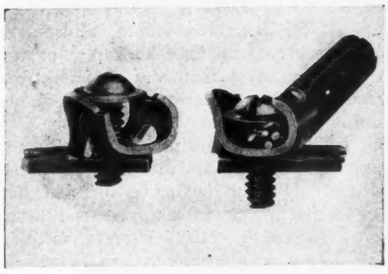


dam or wall so that workmen can get a foothold on the rungs. Wooden wearing blocks are fitted to the top where it contacts concrete. A guardrail 22 in. wide by 27 in. deep runs from the top to the 22x24-in. platform comprising the bottom. Weighing 84 lb., it is made to support three or four men. Aluminum Ladder Co., 122 Adams St., Tarentum, Pa.

Mechanical Ring-Balance Meters

Three types. Measure flow of steam, water, gas, air, or oil at static pressures up to 1,000 lb. per sq. inch. The low-pressure models have a welded steel ring with an oil seal; the high-pressure meter

has a ring made of seamless steel tubing with a mercury seal. Scale readings on differentials as low as 3 in. of water are possible. Other features: Steel housing permitting set-up in exposed locations; range adjustable by changing a calibrating weight; 12-in. evenly graduated chart. Available with any combination of indicator, recorder, and cyclometer-type integrator. Republic Flow Meters Co., 2240 Diversey Parkway, Chicago.



Solderless Connector

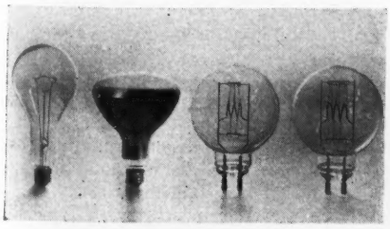
Universal Speed Connector takes from No. 14 to No. 4 wire. Free to rotate around the screw, it allows wire to be inserted from almost any angle, it is said. Its self-centering feature eliminates necessity to wind the wire around the stud or to separate stranded conductors. The range of wire sizes permits use of large wires for service drops to small 30- or 60-amp. switches. Square D Co., Detroit.

Portable Fire-Fighting Unit

Consisting of a 50-lb. cylinder of carbon dioxide, a 50-ft. length of high-pressure reinforced flexible rubber hose, a large discharge horn with quick-opening-type valve for controlling discharge of gas from the cylinder, the unit is clamped to the wall yet can be removed and carried as a portable unit. It discharges clean, dry, non-deteriorating carbon dioxide by pressure of its own expansion. Non-damaging to machinery, products, or finishes, it is said. C-O-Two Fire Equipment Co., 10 Empire St., Newark, N. J.

Drying Lamps

Four infra-red drying lamps in 250-, 500-, and 1,000-watt sizes find application in heating and drying processes including



drying of enamels, lacquers, paints, blueprints, motor and transformer windings, latex, cardboard. The 250-watt lamps, with medium screw base, are pear-shaped with clear glass bulb, or are reflector type, inside-frosted. The 500- and 1,000-watt lamps have clear glass globular bulbs

CLARKAT TRUCTRACTOR -gas powered for 24 hr. service and just as potent the last hour as the first!

A streamlined, steel turreted power tank that pulls as much as 40 tons on trailers—cuts the cost of moving materials, parts and finished product between departments.

Turns in a 57 in. radius, travels at 8 m.p.h., threads crowded aisles, passes through narrow doorways, climbs ramps, operates on congested platforms, hauls 20 times its own weight, carries 4 gal. of gas, ample for an average day's work.

Driver comfortably and safely seated within ½ in. steel body, couples or uncouples trailer train without dismounting. Hydraulic brakes on rear drive wheels. Dual front wheel assures stability.

Built in two models—25 and 40-ton capacity.
Write for "Clarkat" Bulletin.

CLARK TRUCTRACTOR
Div. of Clark Equipment Co.
116 SPRINGFIELD PLACE • BATTLE CREEK, MICH.

This plant cuts handling costs 39% by using CLARK CARLOADER Method.

By handling his product in unit loads with Clark "Carloader" this manufacturer cut his handling costs from production line to freight car by 39%. Ask for details and for Clark "Carloader" Bulletin.

EAGLE
BEARING METALS

DREADNAUGHT —for extreme speed and pressure conditions

OUTLASTA —for medium speed and pressure conditions

DURABLE —for low speed and pressure conditions

THESE 3 METALS MEET MOST BEARING REQUIREMENTS Eagle Bearing Metals are sold through recognized distributors

* 1. Only clean, primary metals are used.
2. Alloying process is under strict pyrometric control.
3. Casting temperatures are exactly controlled.

EAGLE SOLDERS—a complete range of fusion and melting properties — to give economical performance on any kind of industrial solder job.

EAGLE EP PICHER

EAGLE TIN-LOY is an ideal tinning compound that assures an effective lasting bond between bearing metal and the shell. Easy to use—efficient—economical.

THE EAGLE-PICHER LEAD COMPANY
CINCINNATI, OHIO

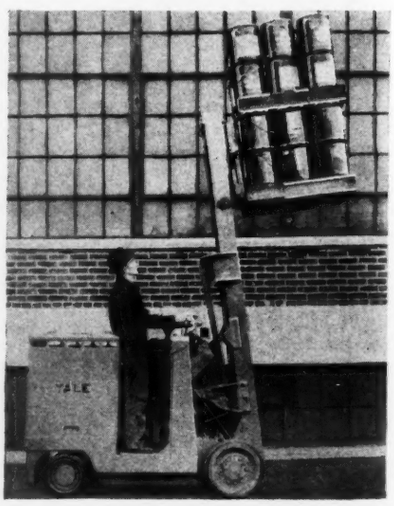
with medium bipost bases for heavy duty work. Designed for use on 105- to 120-volt circuits. With the exception of the 250-watt, built-in, reflector lamp, the lamps are used with aluminum or gold-plated reflectors. Westinghouse Lamp Division, Bloomfield, N. J.

Centrifugal Pump

Available in sizes from 1-4 in. with capacities to 1,000 g.p.m. against heads up to 280 ft.; bronze-fitted, all-iron, or all-bronze construction; horizontal or vertical mountings; motor of any electrical characteristic. Motor and pump are one unit. Features: A large-diameter shaft on rigid bearing mountings for maintaining concentricity in the rotating parts; drip-proof motor having a directed flow of ventilating air which prevents drawing of moisture into the motor. Worthington Pump & Machinery Corp., Harrison, N. J.

Center Control Fork Truck

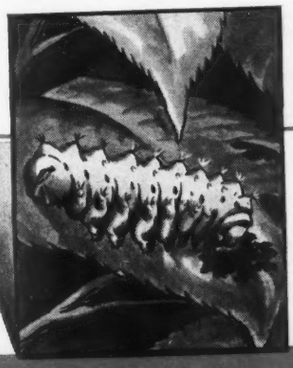
Featuring center control, high-lift and telescoping mechanism, this truck facilitates transportation in and out of box cars, under overhanging obstacles, in narrow aisles. Other features: Unit-welded frame, Cam-o-tactor control for break and make of electrical contacts, Alnico blow-out magnets. The Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia.



High-Speed Synchronous Motor

"Packaged" motor that requires only three wires between motor and line control switch is wired in a manner similar to a squirrel-cage induction motor. Consists of a fabricated, all-steel, synchronous motor; an exciter mounted on top of and V-belt driven by the motor, or direct-connected to the motor; field-control unit mounted on the motor for automatic application and removal of excitation for the field winding of the synchronous motor. Exciter and field-control unit are mounted on and wired to the motor at

THE RIGHT TEETH FOR THE JOB



Nature knows animal teeth! . . . the kinds of "bite" they've got to have to meet their various owners' needs for existence. . . . Teeth for tearing, cutting, gnawing, crushing, grinding, chewing!

Nicholson knows file teeth! . . . the kinds of "bite" they've got to have to meet industry's needs in working with *various materials* toward attaining *various results* in *various products.*

The combinations of factors involved are legion! . . . with materials like irons, steels, brass, aluminum, lead, silver, woods, plastics (and their alloys or derivatives) . . . with parts like forgings, castings, moldings—milled, carved, ground or hammered shapes . . . with operations that call for rough, smooth, lathe, edge or precision filing.

Consider all these, and it is understandable that *correctness* in files—shape, size, tooth cut and angle, teeth per inch—is tremendously important toward good workmanship, fast production, and low filing costs.

An industrial science, indeed, is file-making! Nicholson has been at it seventy-six years. Today there are more than three thousand Nicholson and Black Diamond File types, shapes and sizes with "the right bite for the job"—and with uniform top-notch quality that enables Nicholson to guarantee *"Twelve perfect files in every dozen."*

NICHOLSON FILE CO., Providence, R. I., U. S. A.
CANADIAN PLANT, PORT HOPE, ONT.

FOR STAINLESS AND OTHER ALLOY STEELS

Nicholson has perfected a new file to overcome the peculiar abrasive action of chromium and nickel contents which tend to shorten the life of the general-purpose file. It's one of many developments testifying to Nicholson leadership in files. Stamped "For Stainless Steel"—for easy identification and for specifying purposes.

NICHOLSON FILES

FOR EVERY PURPOSE

NICHOLSON U.S.A. MADE IN U.S.A.

To Hold Packing and Loose Parts
Securely use...
SCOTCH
ADHESIVE TAPES
PRESSURE SENSITIVE • NO WATER REQUIRED
Alert manufacturers are adopting Scotch Adhesive Tapes as the sure, quick way to—
• fasten packing materials firmly in position.
• hold doors, drawers and other loose parts in place.
• attach instruction sheets and envelopes of small parts.
In addition there are Scotch Adhesive Tapes used for masking, holding, splicing, protecting, sealing, identifying and reinforcing.
Scotch Adhesive Tapes hold securely yet are easily removed and leave no residue requiring clean-up. They are available in a wide range of adhesive properties and variety of backings—from tissue thinness to heavy, extra strength and in various widths—providing a suitable tape for practically every industrial requirement.
TRY A ROLL IN YOUR OWN PLANT
Made in U. S. A. by
MINNESOTA MINING & MFG. CO.
SAINT PAUL MINNESOTA
The Desire To Serve
The Ability To Produce
OVER SIXTY TAPES TO CHOOSE FROM
MINNESOTA MINING & MFG. CO.,
SAINT PAUL, MINNESOTA Dept. FM440
Gentlemen: Kindly send sample roll of Scotch Adhesive Tape to be used for.....
Name.....
Address.....
City..... State.....

the factory. Available up to 350 hp. at 1,800 r.p.m. Electric Machinery Mfg. Co., Minneapolis.

Candy-Vending Machine

Three-compartment, one-cent confection vendor displays its contents through double thick glass on its front and two sides. Cabinet of pressed steel finished in baked enamel can be set on counter or stand. Knobs, coin, and confection chutes are chromium finished. The mechanism is treated to prevent corrosion; coin detectors afford slug protection. Stands 18 in. high, 13 in. wide, 8 in. deep. Capacity: approximately 5½ lb. per compartment. Weight: 39 lb. (with stand—50 lb.). The Ad-Lee Co., Inc., 825 South Wabash Ave., Chicago.

Relay

Drawout relay, removable from the switchgear, combines relay and testing devices in one unit. It consists of a case which can be mounted and wired permanently; a self-supporting cradle that carries the relay elements and their terminals; a connecting plug that makes silver contact between the relay terminals and the studs in the case. To take out the cradle containing the relay elements, the cover of the case is removed, the connecting plug withdrawn, the cradle unlatched and drawn out. Built to supplement the removable circuit breakers in metal-clad switchgear and the "drawout" low-voltage air circuit breaker, the relay will be available on almost all relays now mounted in the Universal case. General Electric Co., Schenectady, N. Y.

Blenders

Type RB blender, for recirculation control on small engines, for bypass control of cooling water on machines where close control is not necessary, has balanced piston valves with small ports which limit the valve capacity. All-bronze construction, it is for water pressures not exceeding 150 pounds. Can be equipped with

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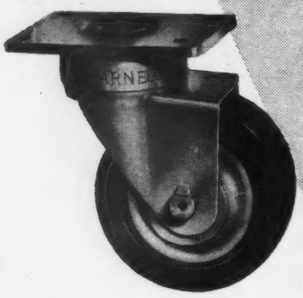
DURABILITY LIGHTNESS STRENGTH



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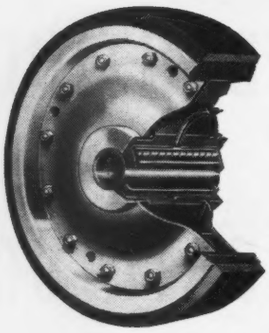

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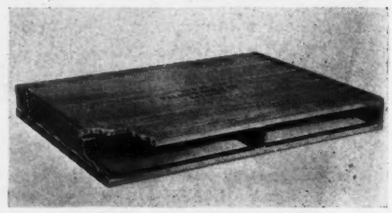
internal bypass adjustable from the outside to provide minimum circulation of water regardless of main valve position. Capacity: 9-62 g.p.m. with 10 lb. pressure drop.

Type BB, for brine recirculation control, is equipped with relief springs to protect it from damage through over-expansion. Can be calibrated at the factory for any temperature down to 0 deg. F.; is said to be adjustable in the field 10 deg. F. lower, and up to 40 deg. F. higher, than factory calibration. Furnished in all-brass construction, maximum working pressure of 150 pounds. Sarco Co., Inc., 183 Madison Ave., New York.



Steel and Wood Pallets

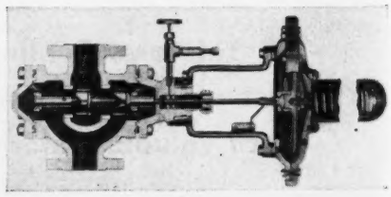
Steel and wood pallets, made in a wide range of sizes, are double-faced, constructed of hard wood faces held rigid with steel bindings and welded to eliminate use of bolts, screws, or nails. By removing the small angle at either end, it is possible to replace boards when necessary. Palmer-Shile Co., 7104 West Jefferson Ave., Detroit.

Wide-Vision Goggles

Features: Hardened renewable safety lenses affording protection against impact, one-piece molded cushion pad of pliable material resistant to perspiration; ventilation holes in the rust-proofed metal portion of the eye-cups; adjustable nose bridge. Range of vision is said to be 150 degrees. Chicago Eye Shield Co., 2361 Dept. C, Warren Blvd., Chicago.

Valves

Line of Stabilflo controlled valves features a wide-range V-port plunger giving the valve a range of 50 to 1. When the valve is lifted off the seats, initial clear-



ance flow is 2 per cent. Up to 100 per cent flow, the valve gives equal percentage increases in flow for equal amounts of valve lift, it is claimed. The plunger is screwed and pinned to the valve stem and is designed for easy field reversal. High-lift construction, floating-power motor, one-piece bonnet and stuffing-box assembly, stainless-steel valve stem,

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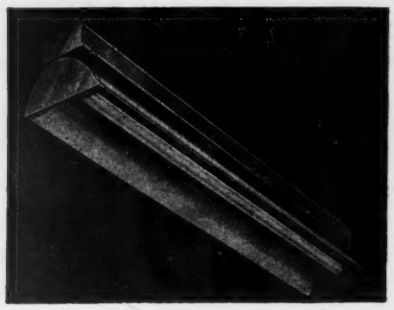
and stainless-steel top and bottom guides for the plungers, are other features of the valve. The Foxboro Co., Foxboro, Mass.

Fluorescent Lighting Unit

Series of single, double, triple (and more), fluorescent lighting units, for use with lamp sizes from 18-48 in., are available unwired or completely wired for hanging. Alzak and Ox-a-lite reflectors, concentrating or diffusing type, are adjustable to 2- or 3-angle positions. The Wiremold Co., Hartford, Conn.



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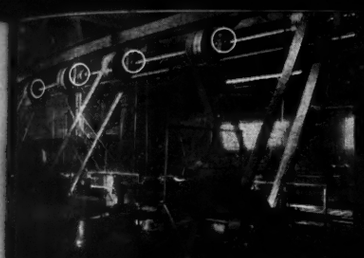
Power-Flow Roof Ventilator features aerodynamic design of the fan blades to assure uniform velocity of the air over the entire working face of the fan. Said to offer a large volume of air per hp. while maintaining low tip speeds; protection against burnout through non-overloading power characteristics; reduction of entrance eddy losses by a patented Log Cone entrance ring. Available in a wide range of sizes and capacities. DeBothezat Ventilating Equipment Division, American Machine & Metals Inc., East Moline, Ill.

Air-Operated Controllers

Fulscope air-operated recording and indicating controllers, for temperature, pressure, rate of flow, and liquid level, feature a third process-control effect—Pre-Act. This supplementary control makes control-valve corrections according to the rate of control-point deviation and stabilizes operation after a change in set point and when equipment is started up. Available in five standard types: fixed high sensitivity, adjustable sensitivity, adjustable sensitivity with automatic reset, adjustable sensitivity with Pre-Act, and adjustable sensitivity with automatic reset and Pre-Act. Taylor Instrument Companies, Rochester, N. Y.

Diesel Electric Set

Addition of a 66- and a 52-kilowatt unit to the line makes five models now available. The new sets are self-contained; are powered by 6-cylinder, heavy-duty Diesel engines. The generator for each is self-regulating, with belt-driven exciter mounted thereon. The rotor is carried by ball bear-



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p Units on the foot ends and Fafnir
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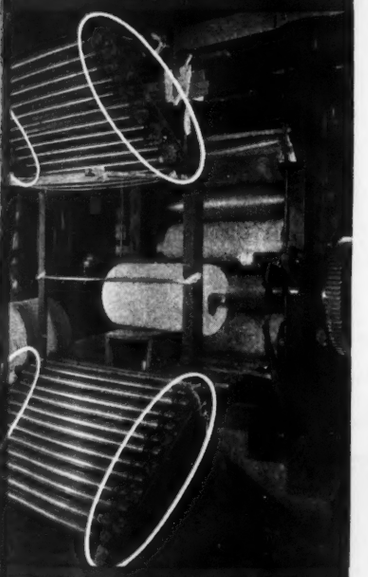

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Nine hundred tons of sand flow daily through each of these pumps at a Western mill. They run 50 minutes every hour, 24 hours every day, and the plain bearings originally used in them lasted an average of only *16 days.* Now Fafnir-equipped, these pumps go out of service only about every three months – to replace worn *pump parts,* not bearings! And Fafnirs make periodic reconditioning easier – it takes 7 hours instead of 16.

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ings and driven with a rubber drive link coupling. A.c. voltages of the direct-connected rotating-field-type generator: 3 phase—110, 220, or 440 volts; 120-208 volts, four-wire; 1 phase—110, 220, or 440 volts. Caterpillar Tractor Co., Peoria, Ill.

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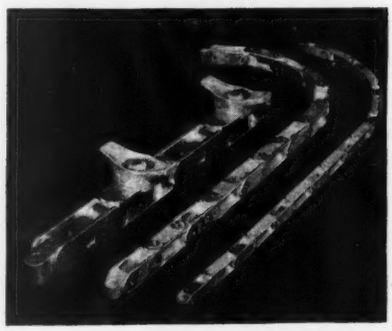
The 540 line of d.c. heavy-duty contactors is available in 100-, 150-, 300-, 600-, 1,200-, and 1,800-amp. sizes. The arc blowout drives the arc from the contacts to the large arc horns above the contacts so that the rupturing of the arc on the horns will prolong contact life. The arc shields are fitted with carbofrax inserts opposite the contact tips. The electric interlock features C-H dust-safe, vertical-contact construction to eliminate contact trouble. The silver contacts are said to be impervious to sulphur fumes and oxidation. The rollers actuating the mechanism are made of Bakelite. Cutler-Hammer, Inc., 315 North 12th St., Milwaukee.

Room Coolers

Three Mobilaire packaged room coolers that require no plumbing connections for installation are powered by hermetically sealed condensing units. Two models—capacities of 4,000 and 6,000 B.t.u. per hour—can be installed directly into the window frame. The 6,000-B.t.u. model has a total conditioned air delivery of 325 cu.ft. per minute. The third model—capacity 8,500 B.t.u. per hour and delivery of 300 cu.ft. of conditioned air per minute—is made for large offices. It cools, dehumidifies, filters, circulates and ventilates air by bringing in fresh air and exhausting room air. The smaller models may be used as window ventilators when cooling is not necessary. Westinghouse Electric & Mfg. Co., East Pittsburgh.

Two-Plane Chain

Has four flat riding surfaces; takes turns, inclines, declines; and covers long distances without transfer, it is claimed.



It consists of a series of universal joints arranged such that the sprocket teeth are radial teeth. It can be used for push and pull service. Available in three sizes: Junior, Senior, and Heavy Duty. The Junior chain is used in the dairy, canning, and clothing industries; the Senior chain in dairies, breweries, canneries, bot-

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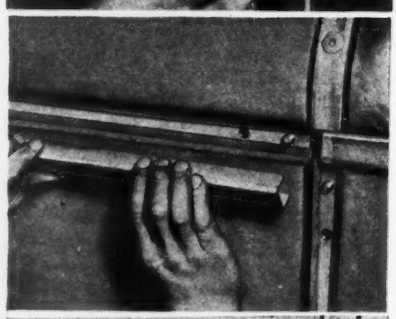
MANHEIM (Lancaster County) PENNA.

tling plants, and petroleum industry to convey cases, cans, oil drums; the Heavy Duty chain to convey barrels, pallets. The Senior chain can be supplied with stainless-steel pins to resist corrosion. The Lamson Co., Syracuse, N. Y.

Pre-fabricated Buildings

Method of construction invented by Harvey B. Lindsay, president Dry-Zero Corporation, Merchandise Mart, Chicago.



Basic elements of the Lindsay structure are (1) a flanged frame; (2) panel sheets with down-turned curved edges all around which fit into the flanged frame; (3) tensioning strips which fit into the flanged frame, rest on the curved edges of the panel sheets, and draw them down when the socket-head screw (4) is tightened.

Fittings, including tees, crosses, and curved corner frames, have been developed to meet any construction requirement. Buildings of this construction may have either flat or pitched roofs—the panels being the same on walls and roof in either case. Roof trusses of special design can be supplied for wide spans. Door frames are fastened directly to the frame of the structure. Window frames are spot welded to the panel sheets. Windows and doors can be replaced by regular panel sections of the same dimensions.

Advantages claimed for this construction are: Panels are in tension and serve to strengthen the structure sufficiently to

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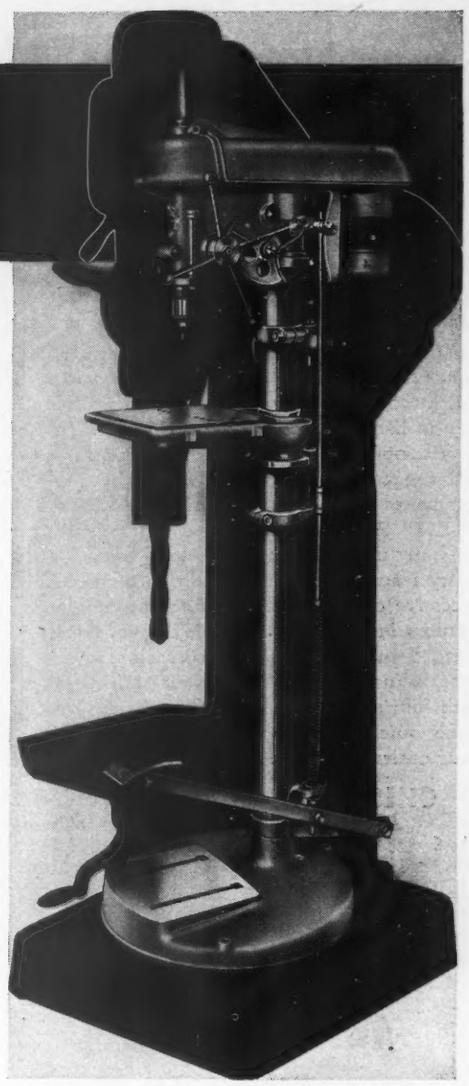

Government does not levy all of the taxes paid by industry. Some of the most costly of all are self-imposed. For example, the plant that uses heavy machine tools to do work for which Walker-Turner light machine tools are better suited is taxing itself needlessly.

Walker-Turner tools are accurate, fast and economical. They require about half the capital investment of heavier tools and often represent a considerable saving in power. They have proved their ability to speed production and substantially reduce costs for hundreds of the country's leading manufacturers (names on request).

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The Model FD961 Drill Press illustrated here, equipped with Jacobs Key Type Chuck, four precision ball bearings, six-spline spindle and many other refinements sells for $77.25 less motor. Weight: 185 lbs.

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puts an end to the overload hazard

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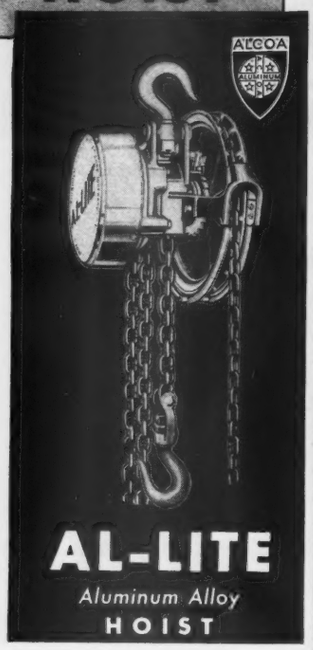

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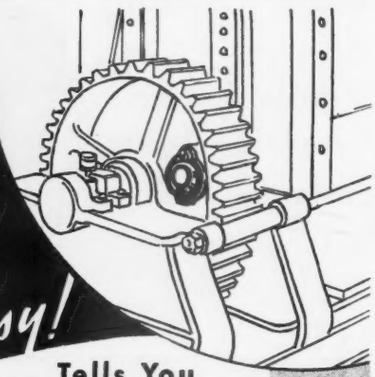

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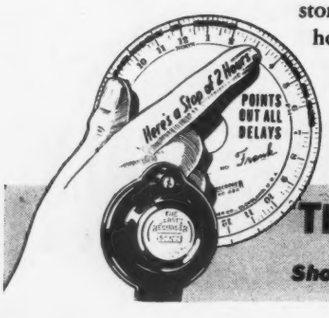
● All delays are shown up, automatically. This "down time" stares out at you from the chart of the *Servis Recorder* (see below). And you bet it gets attention!

How to get this kind of record? Merely bolt or clamp on a *Servis Recorder.* Then your machine writes its own story . . . how busy, when idle and how long, etc. Often leads to enormous savings! Write for folder—*"A Busy Plant."* THE SERVICE RECORDER COMPANY, 1375 Euclid Ave., Cleveland, Ohio.



The Servis Recorder
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permit the use of lighter sheets and framing than commonly used; a wrench is the only tool required to erect or take down; structures can be taken down and re-erected as often as desired without damage or use of new material; size of structures can be altered merely by adding or removing panels.

Switchboard Wires

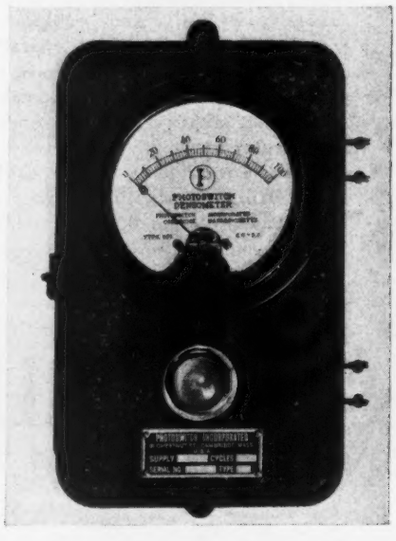
Switchboard wires, using Type SN synthetic insulation, are insulated with Okoseal, a plasticized polyvinyl chloride which is said to be non-inflammable, moisture-resisting, and unaffected by oils, acids, and chemicals. Type OP wire has no braids—mechanical protection is built into the insulation. Type SN is approved for switchboard use up to 80 deg. C., 176 deg. F., and a maximum working voltage of 600 volts. Type SNA switchboard wire is approved for higher temperature operation as the insulation is inclosed within a wall of felted asbestos and an outer braid. Use is permissible where the temperature does not exceed 90 deg. C., 194 deg. F., and a maximum working voltage of 600 volts, it is said. The Okonite Co., Passaic, N. J.

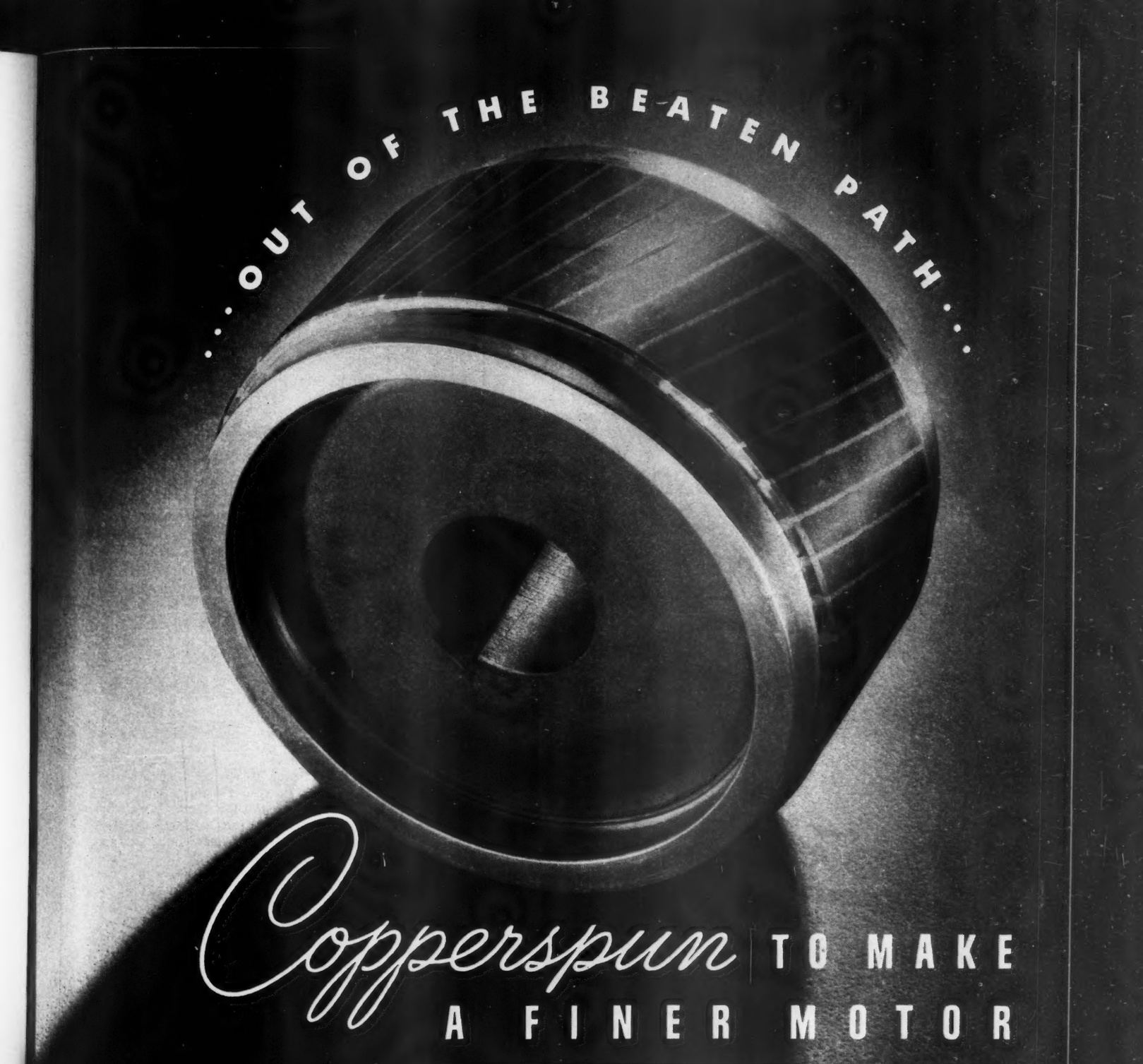
Clamping Tools

For clamping and holding work in production where limited clamping space or nature of job renders large-size clamps unusable. Toggle Clamp 220 measures $1\frac{13}{32}$ by $1\frac{5}{8}$ in. at the base. Said to deliver a pressure ratio of 33 to 1 to the clamping arm when the operating handle is raised. Toggle Pliers 460 measure $6\frac{15}{32}$ in. long overall. Lock nut allows adjustment of clamping head from 0 to $\frac{11}{16}$ in. spacing. Closing of handles said to exert a pressure ratio of 75:1 at the clamping end. Detroit Stamping Co., Detroit.

Electric-Eye Smoke Alarm

Electric-eye smoke alarm with densometer provides photoelectric control of combustion conditions. It continuously observes smoke passing through the flue





Copperspun TO MAKE A FINER MOTOR

THIS is a picture of a rotor from a Fairbanks-Morse Motor

Notice the squirrel cage winding!

It is of copper. The *one* metal most desirable, electrically and mechanically, for meeting the severe service a modern motor must withstand. Copper, the *one* metal of low resistance and low thermal expansion—best able to withstand high temperatures caused by constant plugging and reversing service.

Note further that this copper is *centrifugally cast* into a one-piece winding. *Centrifugally cast* to imbed the winding into the core slots deeply and tightly.

Then, after casting, this rotor is machined and dynamically balanced to the famed Fairbanks-Morse standards of precision.

Only Fairbanks-Morse makes rotors with copper windings which are centrifugally cast. The Copperspun Rotor is an exclusive Fairbanks-Morse development, process, and feature.

For complete information on F-M Motors with Copperspun Rotors, write Fairbanks, Morse and Co., 600 S. Michigan Ave., Chicago, Ill. Branches and service stations throughout the United States and Canada.

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DIESEL ENGINES ELECTRICAL MACHINERY RAILROAD EQUIPMENT WASHERS-IRONERS STOKERS
PUMPS FAIRBANKS SCALES - WATER SYSTEMS FARM EQUIPMENT AIR CONDITIONERS

2 TOUGH PROBLEMS
SOLVED for
DWINELL-WRIGHT
by ALVEY-FERGUSON ENGINEERS

DWINELL-WRIGHT COMPANY
COFFEE AND TEA
BOSTON, MASS.

November 29,1939

The Alvey-Ferguson Company,
Oakley Station,
Cincinnati,
Ohio.

Gentlemen:

Last year, when we were building and equipping our new Coffee Roasting Plant, we had the problem of transferring roasted coffee from the coolers to the stoning machines and we could not conveniently change either the location of the coolers or the stoner hoot. We took this up with your organization who worked out a system of belt conveyors for us. This equipment was very inexpensive, it was simple to erect, and it has performed the operation for which it was intended perfectly. We are very pleased with it.

Recently, we wished to transfer cases of packed coffee from the end of the sealing machine to the spiral gravity chute, without manual handling. We again asked your organization to study the problem, and you have furnished us with an inexpensive roller conveyor. This again has worked out very nicely to our entire satisfaction.

Very truly yours,
DWINELL-WRIGHT COMPANY
President

SAM/AL

President of Dwinell-Wright Company (White House Coffee and Tea) Says, "Entirely Satisfied"!

YOU will notice in Mr. Mead's letter that the two problems of handling roasted coffee and cases of packed coffee were *"worked out very nicely to our entire satisfaction and the equipment performed perfectly."*

Many other successful companies, like Dwinell-Wright, National Distillers, Pepsodent, and Campana, are benefitting by "Scientifically Planned Conveyors." Your company can probably profit, too, by economical equipment designed to effect savings and increase efficiency. Without obligation, request our engineering advice today! The Alvey-Ferguson Co., 102 Disney Street, Cincinnati, Ohio.

P.S. Our new catalog will be sent at your letterhead request

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SCIENTIFICALLY PLANNED
Conveyors

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FACTORY MANAGEMENT *and* MAINTENANCE
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and indicates the smoke density on a 4⅜-in. dial which reads from 0-100. The equipment is set so that a large red signal light indicates when the smoke density exceeds a predetermined value. The alarm consists of the photoelectric control, densometer-signal combination, and light source. The light source and the control are mounted on opposite sides of the flue or breaching and are aligned through entrance tubes or windows. The densometer may be placed in the boiler room and is wired to the photoelectric control. Photoswitch Inc., 21 Chestnut St., Cambridge, Mass.

Lift Truck

Lift-Grip feature consists of an upper "jaw" extending from the top of the mast of the truck. When the forks have entered

the pallet under the pile of crates, the hydraulic lifting mast is set in motion with a lever at the driver's right hand. The load moves up until the upper "jaw" with the spring-tension grip contacts the top of the pile. Self-compensating, spring, tension "pinch" keeps the pile in alignment and prevents spillage while the machine is in motion. Made specially to aid in transportation of crated, boxed, and baled goods for stacking, the "jaw" is removable when the truck is needed for handling other types of material. Towmotor Co., 1233 East 152d St., Cleveland.

Automatic Reset Timers

Series of automatic reset timers and time delay relays finds application in closing and reopening a circuit; opening and reclosing a circuit; making momentary contact; repeating a preset schedule of momentary contacts or timed "on" and "off" operations; resetting instantaneously after a power failure. The timers are furnished with eight terminals. A mechanical lock, magnetically operated, eliminates friction and magnetic clutches and is said to free the timer of disconnect due to vibration. Paragon Electric Co., 37 West Van Buren St., Chicago.

Machine-Vibration Isolator

Controlled Spring Isolator, for use on bases of motors, generators, pumps, ventilating fans, and other equipment whose vibrations and excessive motions wear out machinery and cause cracks in supporting walls and floors, takes care of

horizontal, torsional, and vertical vibration. Designed to overcome both high- and low-frequency vibrations, the isolator is said to operate effectively to reduce those resulting from slow speeds and from reciprocal action. It consists of a coil spring, a rubber load pad, an adjustable rubber snubber inside the base, and is inclosed in a metal jacket for protection of the rubber parts from oil and light. Two sizes: Light duty—for loads from 60-90 lb. per isolator; heavy duty—for loads from 250-270 lb. per isolator. May be used in clusters for heavy machines. Measures: 6 by 6 by approximately 3¾ inches. Johns-Manville, 22 East 40th St., New York.

Thermal Switches

Manually operated Load-Limit switches, for a.c. or d.c. motor control, give thermal overload protection to motors up to 2 hp., 440 volts. (Single phase up to 1½ hp.; polyphase up to 2 hp. Single pole up to ¾ hp.; double pole up to 1½ hp.). Contacts are silver plated with knife action; movable contacts are full floating, self-aligning, and spring reinforced; trip rating is visible from the front of the switch unit which is mounted in a heavy-gage sheet-steel housing. The Arrow-Hart & Hegeman Electric Co., 103 Hawthorn St., Hartford, Conn.

Electric Hoists

Two low-headroom wire-rope and drum-type hoists, with lifting capacity of 500 and 1,000 lb., have been added to the Load

Lifter, Jr. line. Available in lug suspension for bolting in place, hook suspension for hanging; pendant-cord or pushbutton control for single phase or polyphase a.c.; they are combined with a push-type ball-bearing trolley for operating on I-beams or monorail track sections. An automatic upper stop shuts off current when the hook reaches its highest safe position which is said to be within 12¼ in. of the bottom of the beam on which it travels. Shaw-Box Crane & Hoist Division, Manning, Maxwell & Moore, Inc., Muskegon, Mich.

Is Maintenance Important?

Some companies consider maintenance a necessary evil, others recognize that a well planned program is the best insurance for continuous production and low cost operation.

Some of industry's most highly respected maintenance executives have written their views in recent issues of FACTORY.

If you have not already read these articles, we suggest that you review them because they offer many good sound reasons why maintenance is important.

Read FACTORY's "Maintenance Services" Section every month for tested methods gathered from plants all over America.

● Shucks! What's a dime? Or a couple of ounces here or there? Certainly won't break anybody ... BUT, when multiplied thousands of times in your business it means substantial losses that eat big holes into profits!

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My Foremen Help Me Manage

(Continued from page 43)

plant protection, for example — are permanent. Others are dissolved after their report on a specific problem has been accepted by the council and a standard practice instruction issued.

The committee system is not always resorted to, however. The council may feel that the solution to a problem can best be reached by the conference method. Someone is then given the job of preparing and leading a conference on the subject. The conference method classifies the problem, which leads to clarification, which always leads to the answer. The problem is broken up into many parts and becomes relatively simple. As Boss Kettering says: "Any problem thoroughly understood is fairly simple." Our foremen, by the way, have had long training in the conference method, thus have no hesitancy in appearing before the council.

How do we find enough things to discuss for two hours each week?

We have enough now and shall always have more than we can find time for. I spend most of my time in the plant talking with foremen and workmen and discussing their problems with them. I make a note of anything I feel is worth bringing before the council and encourage all the foremen to do the same. If anyone has done a particularly fine job of controlling his expenses, reducing waste, improving quality, or increasing production, I ask him to tell the council about it. Rest assured that he is always glad to do so. We all like a little recognition for a job well done. A pat on the back is always better than a kick in the pants.

Another thing. We have a very active suggestion plan. Over a recent six months period we received 875 suggestions from a total office and factory force of less than 700. Many of the suggestions, to be sure, are not worth much, but they give the employees a chance to pop off on almost any subject, and a safety valve is a good thing to have on any boiler.

Suggestions Encouraged

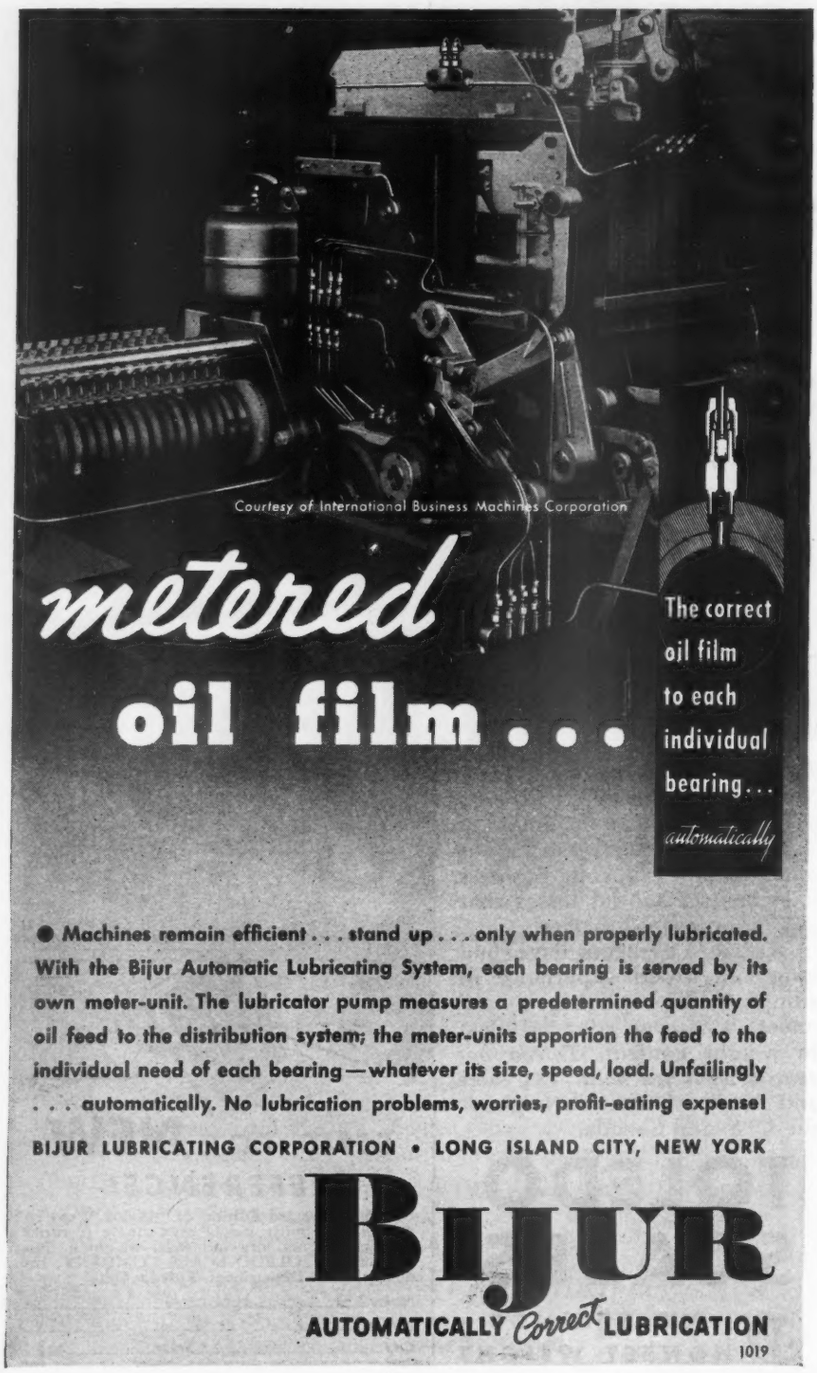
The foremen encourage their men to turn in suggestions, but we have found that some of those submitted were not original with the men but were suggested by the foremen. To give the foremen the recognition they thus deserved, we started an "idea hopper" in our council. Suggestions are now submitted by the foremen and placed in the hopper for action by the council. Each one is discussed, and a decision is either reached or else the suggestion is turned over to an individual or a committee for further investigation.

We stress this idea hopper, because we recognize that *the biggest thing in business is an idea at work.* We know that what we take out of business in the way of profits depends upon the ideas we put into it.

Factory Round Table

The council also sponsors a factory round table group of about twenty men. Some of them are timestudy men, production control men, job setters, and so on. Members of the council present problems to them. For example, the chairman of the council's waste committee recently talked to them about waste reduction, whereupon they decided to bend their efforts toward waste reduction and made it the subject of a series of conferences covering all departments.

Result of the factory management council plan? I could cite a great many. The committee on boxing methods and specifications, to choose a single example, has recommended changes in packing methods that will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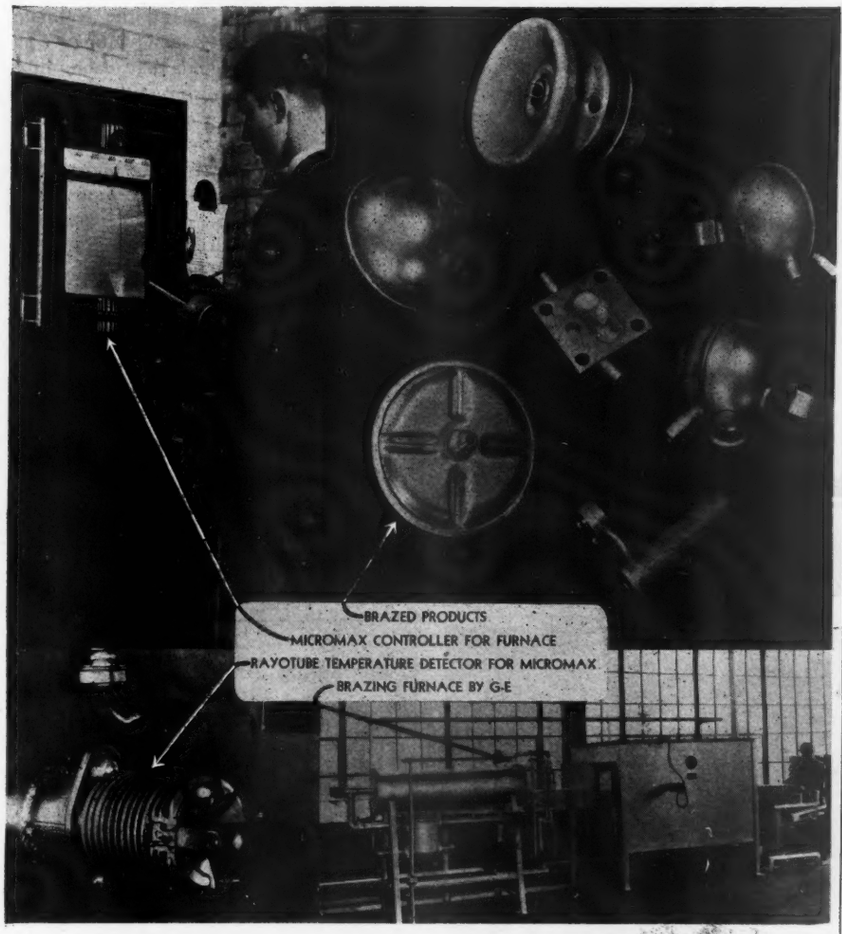

Brazing Quality Is More Easily Controlled When Micromax Pyrometer Uses "Rayotube"

Operation of their controlled-atmosphere brazing furnace, says the Queen City Steel Treating Company, is greatly improved by the dependability of the furnace's Micromax temperature controller. Changes in size or number of parts brazed are compensated for automatically, leaving the operator free to load and unload, and in general to supervise production.

Control equipment consists of a Micromax recording controller, using a Rayotube to detect temperature within the furnace and relays to regulate the heating current.

Among this control equipment, the Rayotube is of principal interest, because it is doing what no ordinary thermocouple could do. A couple would not be dependable, but Rayotube, after months of service, not only operates perfectly but requires no replacement and very slight attention.

The "Looking-In" Rayotube

Secret of Rayotube's success is that it stays outside the furnace; simply "looks" into a closed-end tube which, tightly sealed, projects into the furnace. Rayotube is described in Catalog N-33B, "Micromax and Speedomax Rayotube Pyrometers"; copy on request.

Look To L&N For:

Micromax Controllers, Recorders & Indicators
Speedomax Recorders
Manually-Operated Indicators
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It's Costly To Guess—Easy To Know

For the "trouble-shooting" type of pyrometer servicing, we use and recommend the Portable Indicator 8657-C. It is light, simple, and dependable; calibrated in millivolts; conversion table for any usual couple. $145.00.

For pyrometer servicing that includes the calibration checking of pyrometer instruments, standard cells, thermo-couples and leadwire, we suggest the Portable Precision Potentiometer, 8662, as shown. It is several times as precise as the smaller instrument, with correspondingly greater sensitivity; weighs 31 lb but is amply accurate for most laboratory as well as all field service, and is far simpler to use than most laboratory potentiometers. It is calibrated in millivolts; has conversion tables; may be used with any couple. $225.00.

Want Uniform Carburizing? Use The New Homocarb

The problem of how to reduce the percentage of rejects in mass-production carburizing is being solved, in an increasing number of plants, by the use of the new Homocarb carburizing furnace. The equipment causes a uniformly hard case to form on every surface of every part; case forms at the same speed throughout the load, and may be as shallow or as deep, within the carburizing range, as desired. Write for Catalog T-623, "Homocarb Furnace."

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MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

certainly save the company a great deal more than $5,000 a year.

Or take the matter of waste paper. Just to illustrate how great the possibilities for saving may be, we use some 300 carloads of paper a year. By changing the trim from ¼ to ⅛ inch on a side, a saving of several thousand dollars a year was made. I was unsuccessful in selling this idea myself, but when the job was turned over to the committee, they did it.

To keep the members of the council posted week by week on the company's position, our factory budget man presents large charts on such things as orders received, shipments by weeks, unshipped business on hand, per cent of factory payroll to shipments, average weekly shipments, average weekly payroll, overtime in hours and dollars, raw materials and finished goods inventories.

Among Those Present

We also have heads of office, sales, and advertising departments discuss such things as sales promotion, taxation, customer relations, unemployment insurance.

Last year the council selected four of its members to attend the National Association of Foremen Clubs' convention, but specified that each must attend different conferences and submit reports to the council. Likewise if any member attends, say, a National Safety Council meeting, he must come back prepared to give a resumé of the proceedings. Even I am not exempted.

I have already hinted at some of the results we have been getting from this plan of ours to manage our plant on a cooperative basis. We are enthusiastic because of those tangible results. We have also found that there is a different spirit today among our supervisory force. This spirit has permeated to the rank and file. We have improved the quality of our product, reduced waste, and made some very satisfactory reductions in costs. The cooperative plan must, we feel sure, be given much of the credit for this fine showing.

WIRE-DRAWING MACHINES BY VAUGHN CONTROL BY EC&M

THESE 4-HR Vaughn Wire-Drawing Machines, equipped with an adjustable speed motor for each spindle and operated by a simple method of control developed by EC&M, are giving excellent results in drawing high carbon wire.

Although the weight of the wire added to the last spindle increases the flywheel effect of the last motor-drive, EC&M has engineered a system of control which compensates for this condition automatically. The EC&M Full Magnetic Controller is designed to distribute the dynamic braking torque in proportion to the inertia of each spindle so that all spindles stop *uniformly* . . . under any condition of load.

And when ready to strip a coil, EC&M allows the last or gathering spindle to be backed up easily by hand, permitting slack in the wire when a finished coil is to be removed.

This unique method of control for wire-drawing machines gives superior operating results. Consult our nearby sales office for complete data.

THE ELECTRIC CONTROLLER & MFG. CO. E&M CLEVELAND, OHIO

HEAVY DUTY MOTOR CONTROL FOR CRANES, MILL DRIVES AND MACHINERY-BRAKES - LIMIT STOPS - LIFTING MAGNETS AND AUTOMATIC WELD TIMERS

Inspectors Are Born That Way

(Continued from page 45)

every other unit, this ability would not be called for.

The foregoing consideration indicates the importance of lighting and the importance of a uniform, non-confusing background for the work of inspection. From its effect on test performance, we are inclined to the view that polarized light, possibly from more than one source, will improve the quality and speed of inspection. Certainly there is an optimum illumination, experimentally determinable, for each job *and each operator*. A non-glaring, non-confusing background, in gray or in a complementary color of low intensity, aids in the isolation of the unit from the group or bundle as well as from the background and thereby increases the effectiveness of inspection.

The Confusion Factor

In designing new tests of perceptual ability we have introduced the confusion factor as well as increased the number of elements in each unit in successive tests. Thus in Test A (Figure 1), the first revised form of the original perception test previously reported (*Factory*, Jan., 1938, page 83), there is only one element standard or off-standard in the unit or item, and the whole item is isolated by the encircling ring. In Test B (Figure 2), there are two elements, either or both of which may be off-standard, but the item is still isolated by the ring. In Test C (Figure 3), the number of elements is increased to three, and the confusion element is

CLEVELAND PUNCH & SHEAR APPROVES LUBRI-ZOL TO PREVENT CLOGGED GREASE LINES

● Cleveland Punch and Shear Works Company invested thousands in development and perfection of giant presses like this one. Occasionally trouble developed which was no fault of the presses. Customers would unknowingly use soap base lubricants which have a habit of separating out, then those high pressure lubricating lines would plug, bearings run dry and finally fail.

A Lubri-Zol field engineer isolated the real trouble, recommended one of Lubri-Zol's Special Industrial Lubricants—an aluminum base lubricant that is a colloidal dispersion. Result? Absolutely no separation, no clogged lines, and better yet, the quantity of grease used is about one-half of that previously required. All new presses now leave the plant with Lubri-Zol in the lubricating system.

Lubri-Zol's business in industrial lubricating specialties is based on building "alloyed" oils and greases for the more difficult industrial lubricating jobs. Lubri-Zol patented processing imparts high film strength, greater oiliness and increased stability. The resulting Lubri-Zol specialties are fortified for the increased service demanded by modern production needs.

We'll be glad to send a trained engineer to work with you, no obligation of course. Just write to—

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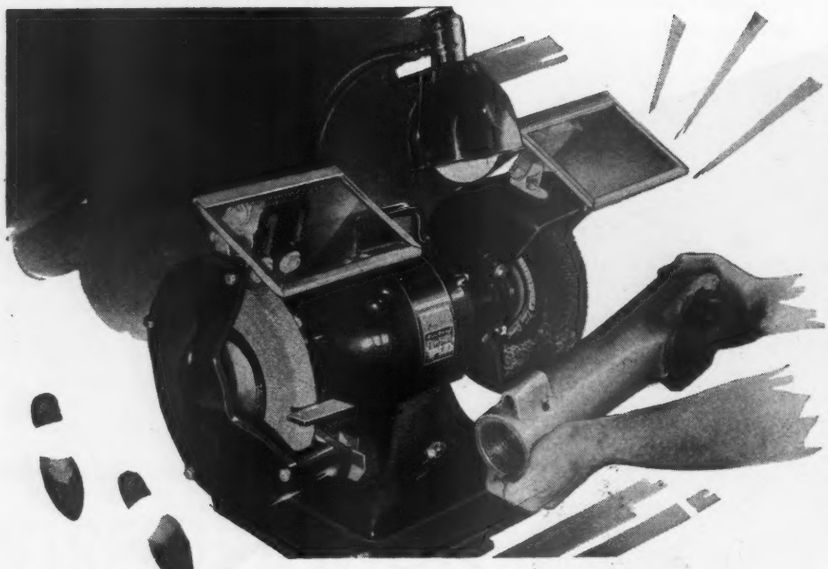

These **BENCH GRINDERS**

Save Wasteful Steps!

IT PAYS to have plenty of bench grinders. Spotted at handy points in your plant, Van Dorn Bench Grinders sharpen tools, wire-brush, burnish, buff and grind *right on the job.* They save time and steps carrying work to and from grinders—and speed up dozens of jobs that otherwise require slow, laborious hand operations. Van Dorn offers a choice of four models priced from $22.50 up: 6" Junior, ¼ H.P.; 6" Heavy Duty, ⅓ H.P.; 8" model, ½ H.P. and the big 10" Grinder with full 1 H.P. motor. Ask your Van Dorn Jobber to show you these powerful grinders, and recommend the proper ones for your work, or write to: Van Dorn Electric Tools (Div. of Black & Decker Mfg. Co.), 719 Joppa Road, Towson, Md.

"Van Dorn"

THE "RED HEADED" PORTABLE ELECTRIC TOOLS

Perpetual Equipment Show

Do you realize that leading equipment and materials manufacturers conduct a perpetual equipment show for you every month in the advertising pages of FACTORY?

In these pages they bring to you their latest available information and ideas. During the course of a year, you find in FACTORY around 1500 pages of advertising from 300 leading manufacturers.

As one reader put it—"I consider the advertising pages of FACTORY a most useful source of information on the latest developments in equipment and materials."

introduced by the removal of the ring. In Test D (Figure 4), four elements are used, and the confusion is increased by the arrangement of the items in close proximity to one another.

These four tests are designed for the easy and early identification of persons with the basic abilities required by most inspection jobs. Each test begins with easy items that almost any person can mark correctly and ends with items so difficult that most persons can only guess at their classification. Tests C and D are designed to be given only to those persons who make high scores on Tests A and B.

Scored for Speed

All tests are scored for speed as well as accuracy, since time per unit is an important factor in the work of inspection. Many persons, such as artists and draftsmen, will make high scores for accuracy on these tests, but will achieve these results at a speed far too low to qualify for industrial production. This is to be expected, since the time factor is seldom of importance in these professional fields. When such tests are used for the classification of applicants for training in these and similar professions, the time factor may be disregarded.

Accuracy scores on these tests are uncorrelated with scores on an intelligence test. Time scores are correlated 0.20, a value so low that it is probably due to the fact that both types of test involve "pencil-and-paper manipulation" as a common factor. Time scores can be somewhat improved by a person who takes the test several times, but accuracy scores remain about the same —as one would expect, since "you can't hit what you can't see" except by sheer accident.

Could Be More Difficult

These four tests are not as difficult or as complicated as such tests can be made. Both the number of elements in the items and the degree of confusion can be indefinitely increased, if there were any practical reason for so doing. It is interesting to note that this is one of the few forms of mental tests that can be made of such an order of difficulty that their maker can not pass them himself. Most readers will conclude, after attempting Tests A and B, that they would probably not excel as inspectors and will rationalize this conclusion with the remark that they wouldn't like such work anyway.

[*Part 2 of "Inspectors Are Born That Way" will appear in an early issue. In it the author proceeds to a discussion of three-dimensional tests.*—EDITOR.]

These Never Lose Their GRIP

Fig. 1645 Pats. Pend.

UNBRAKO

SELF-LOCKING SET SCREWS

with the Knurled Points

Fig. 1646 Pat's. Pend.

Set 'em up with no more than ordinary pressure and the ingenious knurled cup points go to work . . . automatically lock into place with a grip that no amount of vibration can loosen.

The beauty of this feature is that, by equipping your machines with "Unbrako" Self-Lockers, you'll be setting up for added safety, freedom from breakdowns and slicing maintenance costs at the same time. But in spite of the gripping ability which insures these advantages, "Unbrako" Self-Locking Set Screws are easily applied, as easily removed and may be re-used indefinitely with the same dependability. Thousands of users have already been enjoying the savings these features insure — how about you?

. . . and these fit for the TOUGHEST JOBS

UNBRAKO

SOCKET SCREWS

Fig. 232 "UNBRAKO" Hollow Set Screw

Many advantages distinguish "Unbrako" Socket Screws and qualify them for dependable service on your toughest jobs.

Strong, tough alloys machined to micrometric specifications and then rigidly inspected insure a uniformly perfect fit and grip.

Then there are the cold-forged "Better Gripping Heads"—found only on "Unbrako" Products—which provide a non-slip gripping surface for the mechanic's fingers or pliers. This prevents fumbling, speeds up production.

Fig. 1434 Knurled "UNBRAKO" Socket Head Cap Screw with the "Better Gripping Head." Pats. Pend.

Fig. 1446 Knurled "UNBRAKO" Socket Head Stripper Bolt with the "Better Gripping Head"

These and other advantages can save for you, too . . . investigate them now.

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WHATEVER your business—whatever you make, handle, ship — you may be able to use Fibreen to advantage. It's a tough, reenforced, wear-resistant, pliable paper—heavily waterproofed with a sealed-in layer of special asphalt. It is saving time and money in many ways for many manufacturers. Here are a few suggestions:

- As a tough, waterproof wrapping, packaging or bagging material, it carries a wide variety of products safely to their destination.
- Many concerns use Fibreen to protect materials in storage, either in warehouses or outside—since it is weather resistant and will not burst or tear when exposed to wetting.

Maybe you'll visualize practical uses for this strong, durable material in products which you make.

Fibreen is low in cost and available in convenient sizes — write for a generous sheet or roll to try and test in your business.

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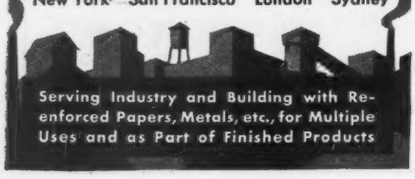

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They Say and Do

"Business Statesmanship" Wins Praise of TNEC

In one corner of Washington, at least, kind words are being showered upon America's business and industrial leadership.

"In recent months business statesmanship has reached a new high," declares the important Temporary National Economic Committee in its seventh report to the President on price movements since the start of the war in Europe. "As the National Association of Manufacturers has so well stated, one of the prerequisites of stable prosperity is 'the practice of agricultural, industrial, and commercial commodities having such a relationship as will encourage sufficient buying and selling to provide steady employment for those able and willing to work.' In recent months that principle of price statesmanship has been not only precept but practice."

The big thing about America's reaction to the first six months of war abroad is the fact that the nation has moved through the whole troublesome period on an even economic keel. There has been no panic, no hysteria, little foolish speculation, and no "boom and bust." The war's outbreak did kick basic commodity prices sharply upward to a point 27.2 per cent higher than pre-war figures on September 22, 1939. But steadying influences asserted themselves promptly so that the index thereafter eased downward to a level of about only 15 per cent higher. The prices of finished goods have remained virtually steady throughout.

•

Census Bureau Asks Industry's Help

The 1940 Census of Manufactures is rolling along in good style, according to U. S. Census Bureau officials. At the end of the first two months, 27,585 returns had been received, comparing favorably with 22,658 gathered during the corresponding period in the census taken two years ago.

Management's close attention to three points is requested by Thomas J. Fitzgerald, Chief Statistician for Manufactures of the Census Bureau, who says:

"Manufacturers, by observing these precautions, can eliminate the necessity of follow-up correspondence in making their returns:

"In listing 'all other employees' in addition to those falling in the classification of salaried officers, manufacturing, distribution or construction employees, the type of work they performed should be stated. Clerks in factories, unless they devote the major portion of their time to sales or distribution activities, should be reported as manufacturing employees.

"Total cost of *all* fuel, including wood, gas, purchased steam, and so on, should be reported.

"The query on what were the principal materials used should not be overlooked. The answers to this, when tabulated, will provide important market information."

With returns so expedited, the Bureau hopes to begin publication of reports by May. The value of Census statistics is "enhanced by their timeliness," Mr. Fitzgerald points out.

•

Coast Company Opens Labor Relations College

Now nationally famous as a West Coast citadel of labor harmony, Paraffine Companies, Inc., has taken a unique new step in advancing its own doctrines of union-management cooperation.

FACTORY readers will recall the highly readable and exceptionally frank account of the company's policies set forth by W. H. Lowe, president, under the title "Living in Peace with Eighteen Unions," in the March, 1939, issue. A good many observers feared at the time that Pabco (the company's nickname) was sticking its neck out by proclaiming peace in the midst of the dangerous Coast labor situation then prevailing. Mr. Lowe admitted in his FACTORY article that the management was keeping its fingers crossed. But Pabco's policies panned out brilliantly and the company came through the often-agonizing process of unionization without labor trouble and, in fact, with increased production and efficiency despite increased wage scales. This, for a company employing 6,000 wage earners in 55 scattered plants, making a dozen different products from linoleum to mulch paper, and doing business with 18 different unions both AFL and CIO, would have been a major achievement anywhere in the country. On the West Coast it was a miracle.

Last year, at its big Emoryville, Calif., plant, Pabco conducted a successful labor leader training class for shop officials, and a course in leadership for superintendents and foremen. As an

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● Drilling hole for an oil control valve in an intricate precision machine using a SKILSAW DRILL of ¼ in. capacity.
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WHAT better proof could you want of the quality and performance of SKILSAW TOOLS . . . than the fact that so many manufacturers of precision machinery use them in their own plants to improve workmanship, reduce costs and speed up production!

Illustrated above are some of the usually slow and costly operations *made fast and profitable* by the use of SKILSAW TOOLS at the T & F Engineering Co., Cleveland, builders of special precision machinery. It's the same in every industry — SKILSAW TOOLS are preferred because they're designed and built to the most exacting precision standards . . . because they give long years of dependable, trouble-free operation.

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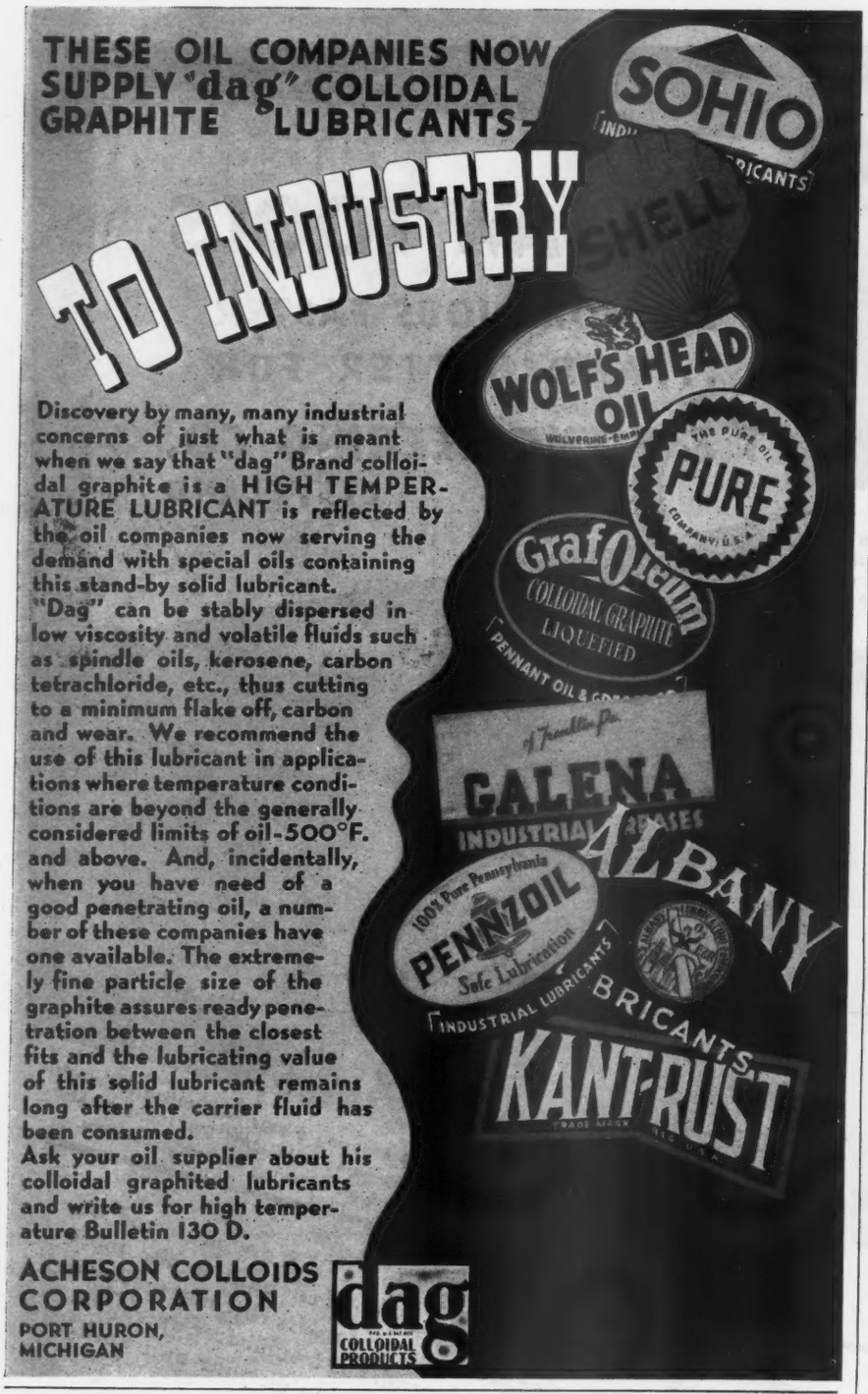
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Is Maintenance Important?

Some companies consider maintenance a necessary evil, others recognize that a well planned program is the best insurance for continuous production and low cost operation.

Some of industry's most highly respected maintenance executives have written their views in recent issues of FACTORY.

If you have not already read these articles, we suggest that you review them because they offer many good sound reasons why maintenance is important.

Read FACTORY's "Maintenance Services" Section every month for tested methods gathered from plants all over America.

outgrowth of this, Pabco now announces the establishments of its own Labor Relations College, the largest ever sponsored by any organization with a "student body" of more than 200 and a "faculty" of labor leaders, professors, industrialists, editors, and representatives of the public.

Wage earners and supervisors will sit shoulder to shoulder in the classroom to receive instruction emphasizing "the identity of interests of management and men, workers, executives, unions, and companies."

"Getting along together is our theme," says R. H. Shainwald, Pabco vice-president.

Here is a partial list of the speakers: A. C. Galbraith, vice-president of the Union Oil Company; Professor Paul Eliel of Stanford University; John F. Shelley, president of the San Francisco Central Labor Council; Jennie Matyas, organizer of the International Ladies Garment Workers Union; Harry Melinkov, president of the Pacific Coast Labor Bureau; Clarence Lindner, publisher of the San Francisco *Examiner*; Almon E. Roth, president of the Employers Council of San Francisco; Germaine Bulcke, secretary of the San Francisco District CIO Council; and Henry Strobel, chairman of the Labor Relations Committee of the Associated Farmers of California.

•

Salaried Aides at GMC to Get Lay-Off Pay

In General Motor's program for easing the strain of periodic unemployment on its workers, the salaried employee has not been forgotten. And this is big news to the 40,000 white collar workers employed by the company and its wholly owned subsidiaries.

A "separation allowance" is the company's name for the new plan under which any salaried employee with one year or more of continuous service, who is released for reasons beyond his control, will receive 25 per cent of one month's pay for each year of service up to ten years and 35 per cent of one month's pay for each year of service in excess of ten years.

•

Group Seek Scientific Collective Bargaining

The rules governing collective agreements in American industry have grown up with little effort to produce the fullest cooperation between management and labor, according to Morris L. Cooke, industrial engineer and former Rural Electrification Administrator.

Mr. Cooke's comment accompanied the announcement of the formation of

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to do a man's work...

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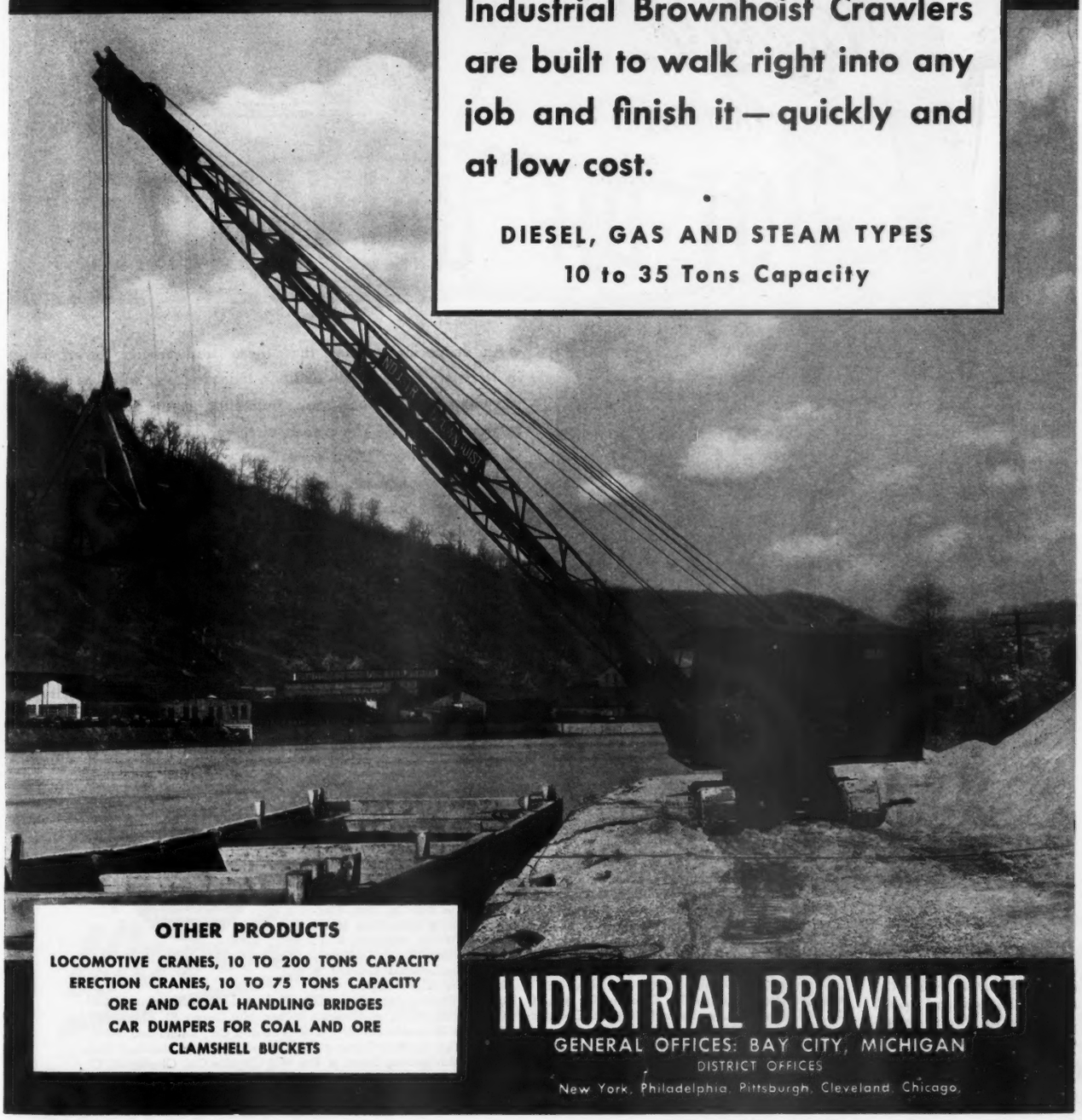

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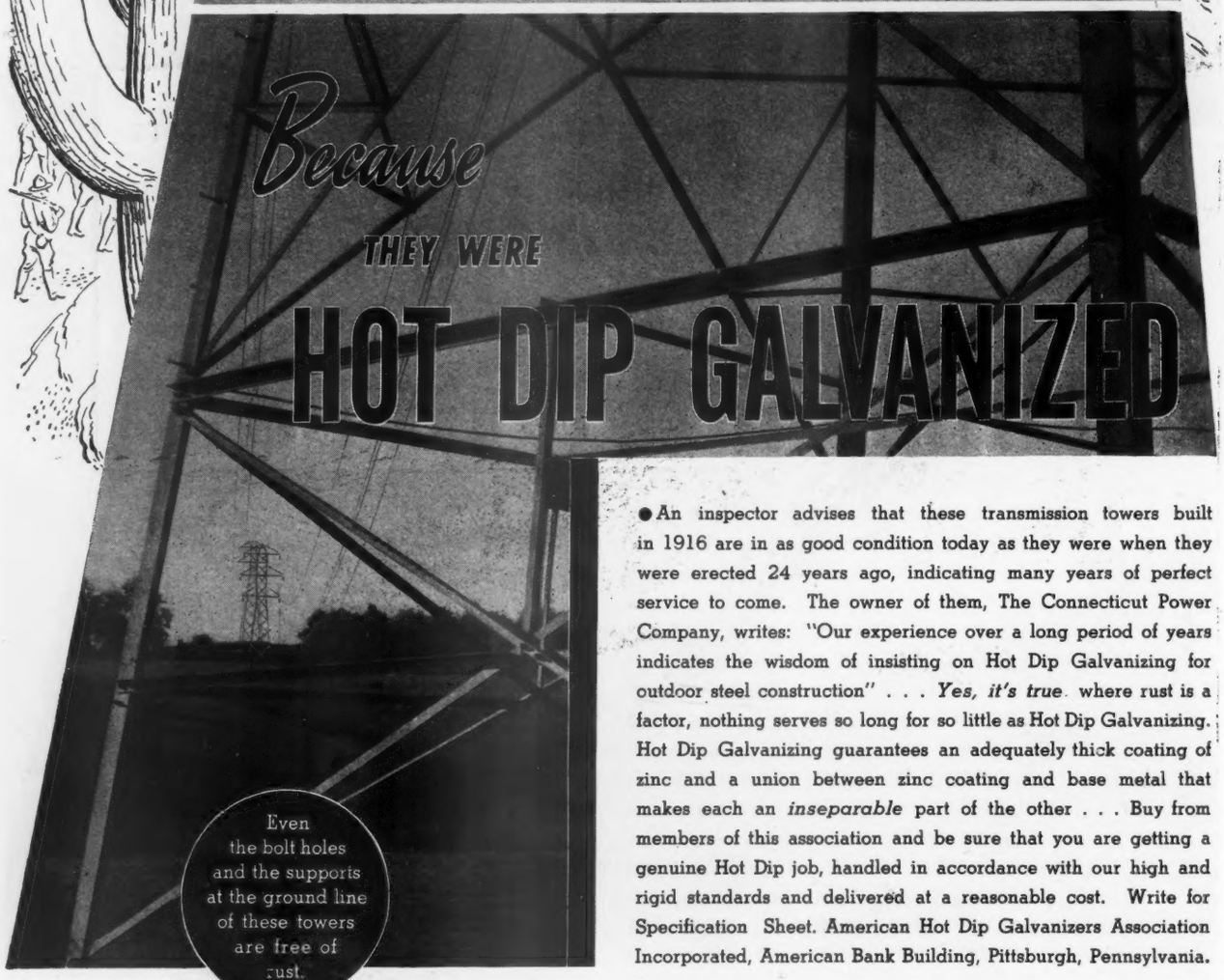
SINCE PERSHING MARCHED INTO MEXICO

THESE TOWERS HAVE REMAINED IN PERFECT CONDITION


Because
THEY WERE
HOT DIP GALVANIZED
Even the bolt holes and the supports at the ground line of these towers are free of rust.

●An inspector advises that these transmission towers built in 1916 are in as good condition today as they were when they were erected 24 years ago, indicating many years of perfect service to come. The owner of them, The Connecticut Power Company, writes: "Our experience over a long period of years indicates the wisdom of insisting on Hot Dip Galvanizing for outdoor steel construction" . . . *Yes, it's true* where rust is a factor, nothing serves so long for so little as Hot Dip Galvanizing. Hot Dip Galvanizing guarantees an adequately thick coating of zinc and a union between zinc coating and base metal that makes each an *inseparable* part of the other . . . Buy from members of this association and be sure that you are getting a genuine Hot Dip job, handled in accordance with our high and rigid standards and delivered at a reasonable cost. Write for Specification Sheet. American Hot Dip Galvanizers Association Incorporated, American Bank Building, Pittsburgh, Pennsylvania.

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FROM OUR FILES — CASE NO. 0652. Transmission towers of The Connecticut Power Co., between Cromwell and Bristol, galvanized by Wilcox, Crittenden & Co., in 1916.

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1. Your WOOD'S Distributor can help you in a survey of your present power transmission set-up to spot obsolete, money-wasting equipment!

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3. The Distributor will work with you in preparing recommendations for needed modernization and in selling them to management!

4. The Distributor follows through on your orders so that your deliveries are made "on the dot"!

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6. Your Distributor can give you closer personal service than is frequently possible otherwise. His time is your time when, and as often as you need him!

Everything in Transmission: Bearings—Collars—Clutches—Couplings—Contactors—Hangers—Pillow Blocks—Pulleys—V-Belt Sheaves and Complete Drives. *Distributors in all Trading Centers. Ask for the name of the one nearest you!*

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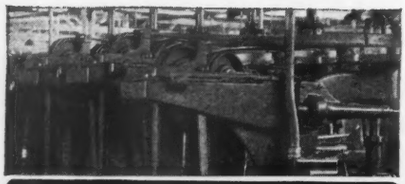

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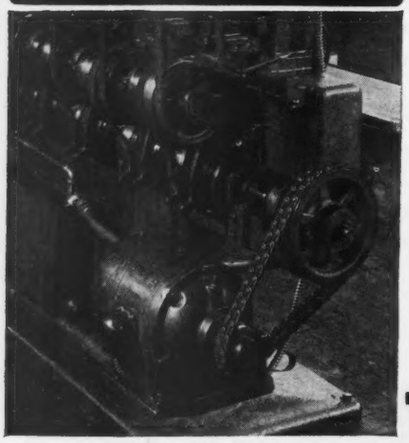

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*60 seconds to uncouple needed length from roll, 60 seconds to couple endless around any drive.

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Collective Bargaining Associates, designed to promote principles of collective bargaining on a more scientific basis.

The Association will study current practices, assemble data on model agreements between organized labor groups and managements, and develop methods "for the joint determination of production standards and wages so as to safeguard the common interest through high productivity, low costs, reasonable wages, and adequate profits."

In this way the group hopes to work toward "the increase of production through the joint formulation of methods for unleashing creative attitudes and performance at all levels, both in management and among the workers."

The association will make its data available to those engaged in negotiating agreements, will publicize successful instances of collective bargaining, will maintain lists of experts who can be suggested for special service in facilitating the operation of collective bargaining, and will seek to encourage further research in the field by educational institutions.

Most prominent members of the new organization are Solicitor General Francis Biddle; John M. Carmody, Federal Works Administrator; William M. Leiserson, of the National Labor Relations Board; Otto S. Beyer, Chairman of the Railway Mediation Board; Robert W. Bruere, Chairman of the Maritime Labor Board; Ordway Tead, Chairman of the New York Board of Higher Education, and Mr. Cooke.

•

Smith Report Points Way to NLRB Change

Sooner or later something will be done to change the Wagner Act and the National Labor Relations Board. That is the standing opinion of observers close to the situation, including those who feel that action will be taken this year and those who predict that the set-up will remain unchanged until the next Congress.

All concede that a substantial step toward amendment has been taken with the introduction of a bill (H. R. 8813) introduced by Representative Howard W. Smith, Virginia Democrat, as the first result of the House investigation of NLRB by the committee bearing Smith's name.

Whether the Smith proposals are wholly satisfactory to the dissatisfied element both in labor and management, and whether or not they will do the job they are intended to do, they should prove to be the starting point of a thorough and sincere deliberation of the question. *Factory* readers who are in the writing-to-congressmen mood

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NO wonder he was excited! Here it was after closing hours and a boiler down . . . and, our warehouse 225 miles away! We swung into action, loaded the necessary tubes onto a truck and delivered them the next morning. But that was an emergency, you say—what about regular orders?

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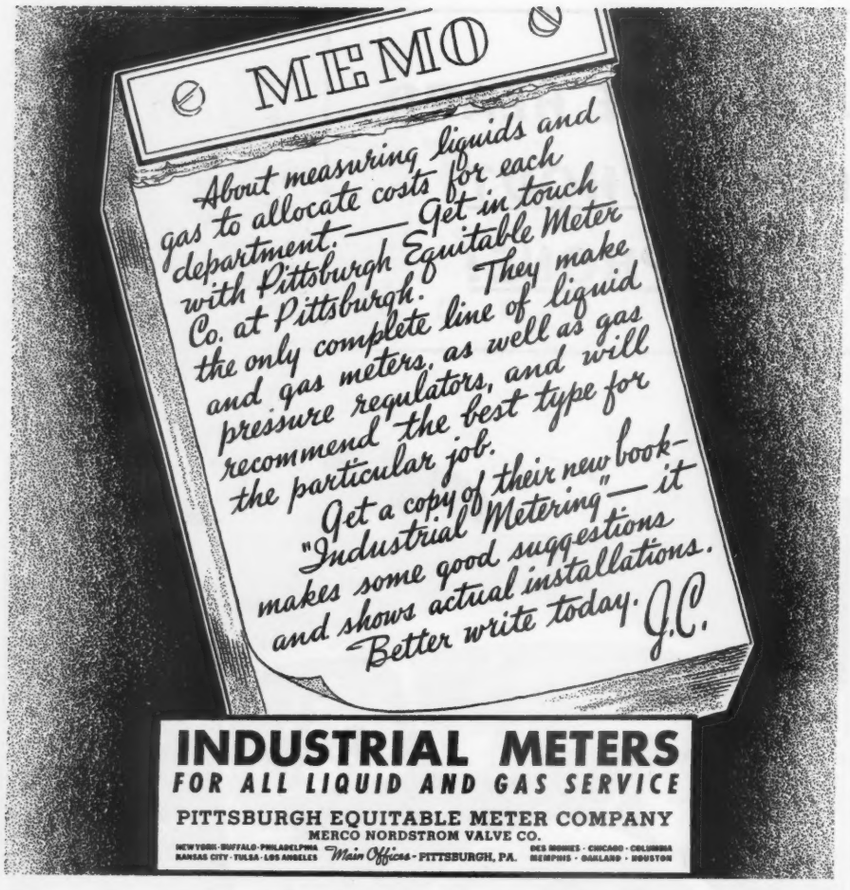
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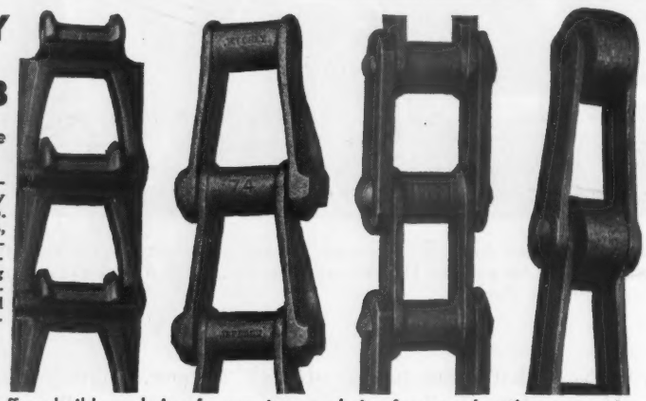

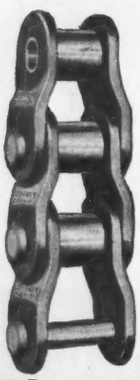

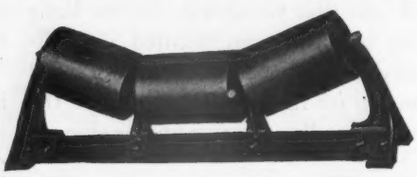

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these days would do well to express their opinions, pro and con, to their state and district representatives in the Senate and House. Here are the outstanding changes proposed in the Smith bill:

Creation of a new three-man National Labor Relations Board to replace the present board.

Separation of the board's administrative, prosecuting, and judicial functions.

Freedom of employers to discuss labor problems with employees provided there is no threat of discriminations, intimidation, or coercion.

Limitation of the board's power to call collective bargaining elections only when requested by employers or employees.

Stipulation that the board's services cannot be invoked in a controversy between unions over the appropriate type of bargaining units.

Elimination from the act's preamble of language stating that the government's policy is to encourage collective bargaining, leaving only the statement that Congress should do everything possible to protect the worker's right to organize for collective bargaining.

Limitation of the time element in board actions so that no charge of violation could be filed more than six months after the event and that no board order for back pay could cover more than six months.

Specific statement that neither employers nor unions would be compelled to reach a collective bargaining agreement or make counter proposals.

Withdrawal of the board's power to reinstate workers who wilfully engaged in violence or seizure or destruction of property.

Conduct of board hearings in conformance with court rules of evidence and Federal Court review of board decisions.

•

Pittsburgh Plate Glass in Wage-Hour Test

Two of the most important legal tests in the history of the administration of the Fair Labor Standards Act are on their way to the United States Supreme Court. One is the test case involving Chicago meat packing houses and the other is the more recent injunction granted by the United States District Court against the Pittsburgh Plate Glass Company, one of the largest manufacturers of plate and window glass in the country.

The Pittsburgh action holds far-reaching significance because it is directed against a corporation with one of the largest wholesale establishments

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CP 806 Midget Drill; weight only 3⅜ lbs.; overall length only 7⅝"; capacity 3/16", available in three speeds.

CP 806 Midget Screw Driver and Nut Runner; weight only 4½ lbs.; overall length only 11¼"; positive or cushion clutches; capacity, No. 8 wood screws or 3/16" machine screws; 3/16" nuts or bolts; available in four speeds.

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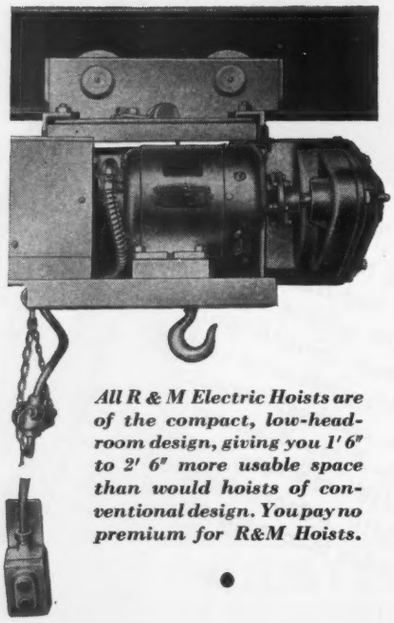

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In any case, let's talk over your hoisting problems, with no obligation on your part, of course. Our different point of view may permit us to make a valuable contribution. Write a letter today, to:

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in the country and is based solely on the company's alleged failure to pay employees the time-and-a-half overtime assured them by the act.

The charge states that the company failed to pay overtime for hours worked in excess of 44 a week between October 24, 1938, and October 24, 1939, and in excess of 42 hours a week thereafter. It thus embraces both the first and second years of the act's minimum provisions. Not only the company's factory employees but also its large corps of wage earners in 75 branch offices and wholesale warehouses are affected.

•

AFL Launches Peaceful Drive for 500,000 Southern Members

"Intensive but peaceful and constructive," is the phrase with which the American Federation of Labor has launched a campaign for 500,000 members in the South.

"This is a drive to promote the welfare of workers and industrial management alike," said George L. Googe, Southern representative of AFL. "We want the cooperation of management, but we want it in a spirit that will be beneficial to both."

Googe instructed his organizers to tell industrialists that "our aims are peaceful and that we are not coming into their businesses to injure them, but to cooperate."

While the new drive will spread out through many industries, the main body of AFL's southward parade will be made up of representatives of the United Textile Workers of America. They seek to enroll an estimated 250,000 unorganized cotton textile workers. The UTW's statement of its aims is likewise peaceful.

"Our differences are going to be settled by arbitration and not by strikes," said C. M. Fox, president of the Union.

•

BOOKS

A PRIMER OF TIME STUDY

F. M. Shumard, Industrial Engineer. McGraw-Hill Book Co., Inc., 330 West 42d St., New York. 519 pages, illustrations, tables, index. $5.

The author assumes that his readers are approaching time-study problems and practices for the first time. Dividing the text into twenty-four chapters, he has based his material on the use of the stop watch to measure industrial operations and set time and energy standards for wage-payment incentive plans. Pertinent questions follow each chapter, and a final group of questions completes the text.

BUSINESS AND THE PUBLIC LIBRARY STEPS IN SUCCESSFUL COOPERATION

Edited by Marian C. Manley for the Public Business Librarians Group of the Special Libraries Association, 31 East 10th St., New York. 83 pages, index. $2.

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Compilation of the conclusions drawn from the experiences of eleven librarians doing business work in public libraries in different parts of the country. Discusses possibilities for comprehensive service to business; means to such an end; practices for efficient administration; needs of executives for public library use; history of business library development and bibliography of its literature. Also included are selective lists of business magazines and trade directories, and notes on periodicals reviewing business publications.

THE NEW TECHNIQUES FOR SUPERVISORS AND FOREMEN

Albert Walton, Assistant Professor of Psychology, The Pennsylvania State College. McGraw-Hill Book Co., Inc., 330 West 42d St., New York. 233 pages, index. $2.50.

An interpretive digest of psychological material to assist the "perplexed but ambitious" supervisor, who has little background in modern psychology, to determine why his methods of handling people and situations have or have not been successful. The author—first a consulting industrial engineer, later a professor of psychology and teacher of foremen training classes in industrial psychology—draws on his own and others experiences to illustrate points discussed in his chapters on human habits; aptitudes and abilities; tests and their uses; personality; resistance to change; fatigue, monotony, and accidents; psychology and scientific management.

THE NATIONAL LABOR RELATIONS ACT—SHOULD IT BE AMENDED?

Compiled by Julia E. Johnsen. H. W. Wilson Co., 950-72 University Ave., New York. 416 pages, bibliography of references. $1.25.

Background of the National Labor Relations Act, criticism of the Act and its administration—the charges and the defense, and the case for and the case against amendment—are the main divisions of this book which contains the pros and cons of prominent spokesmen on the subject together with some of the factual and controversial material underlying public hearings and current discussions. A sidelight on state legislation of a similar nature is also given.

INDUSTRIAL DESIGN, A PRACTICAL GUIDE

Harold Van Doren, Harold Van Doren and Associates, Industrial Designers. McGraw-Hill Book Co., Inc., 330 West 42d St., New York. 388 pages, 32 plates, illustrations, index. $4.50.

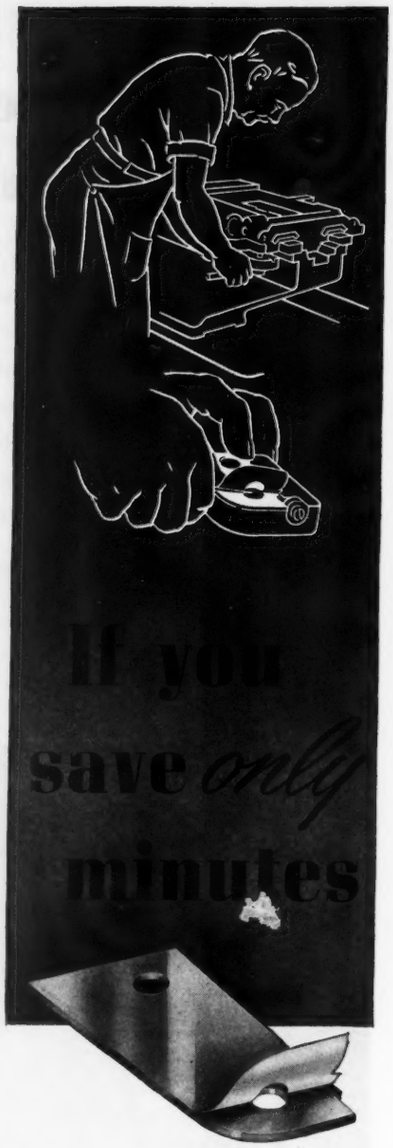
Not rhapsodies, but fact, technique, and anecdote tell what industrial styling and appearance design are all about. Step-by-step procedure in development of salable designs for products and machines is described up to the point of production; fundamentals of three-dimensional design are explained; and the procedure of product styling from preliminary research to finished dimension drawings is outlined. Problems for the beginner and case histories describing development of several products now on the market are included.

TRAINING PROCEDURE

Frank Cushman, Consultant in Vocational Education, Federal Security Agency, U. S. Office of Education. John Wiley & Sons, Inc., 440-4th Ave., New York. 230 pages, index. $2.

Improvement in the performance of work is, the author states, the objective of training employed personnel. The problems encountered in planning, organizing, operating, and maintaining efficient training programs in industrial, business, and public service organizations, are analyzed with a view to stimulating thought on the problems. At the beginning of each chapter is a one-page abstract outlining it. The book ends with discussion of the problem of incorporating values derived from training activities into everyday practices.

(Continued on page 120)



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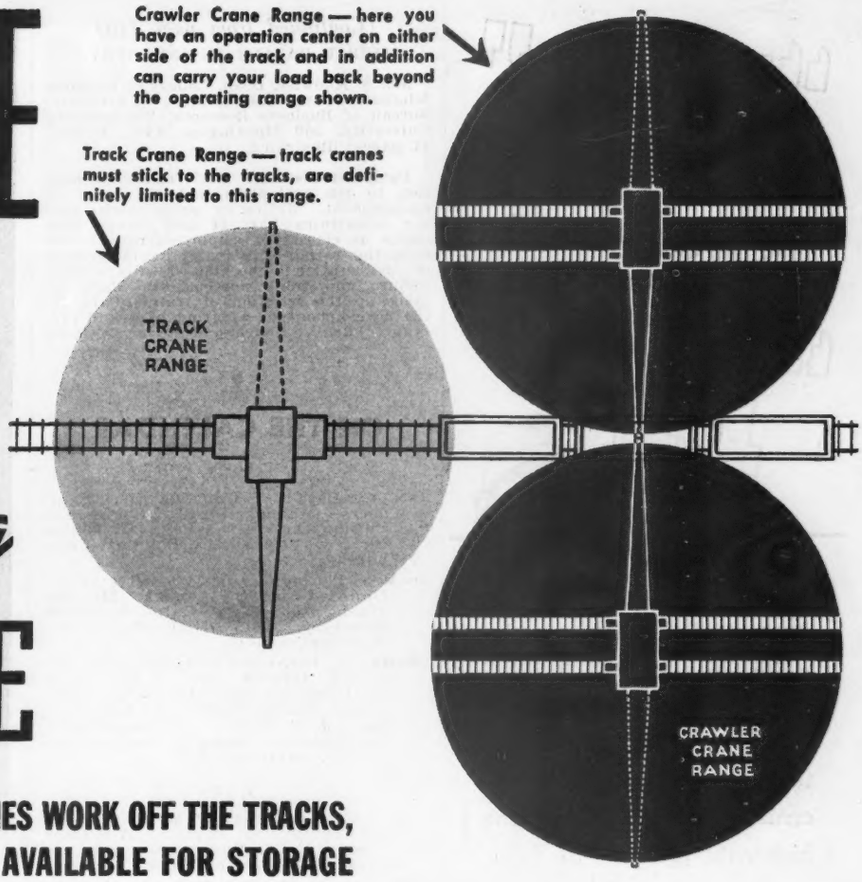
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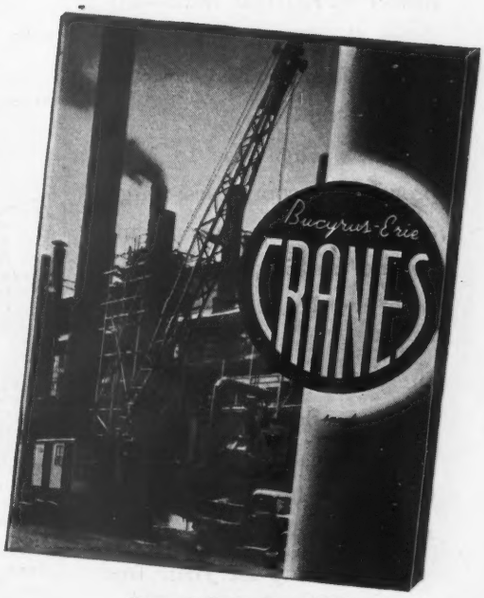

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(Continued from page 118)

MERIT RATING IN INDUSTRY

Asa S. Knowles, Dean, College of Business Administration, Northeastern University. Bureau of Business Research, Northeastern University, 360 Huntington Ave., Boston, 41 pages, illustrated.

Pamphlet discusses merit rating in relation to job evaluation and as a tool of management. Rating by questionnaire survey constitutes Part II and covers such topics as classes of employees rated; who does the rating—his training; importance of deliberation; checking results; merit ratings and trade agreements. Part III takes up the selection of traits; Part IV, the development of a rating plan and program; Part V, dangers of rating systems.

ON THE CALENDAR

APRIL

1–2, Association of Iron and Steel Engineers, Annual Spring Conference, Cincinnati. B. Wiley, Managing Director, 1010 Empire Building, Pittsburgh.

30–May 2, Chamber of Commerce of the United States, Annual Meeting, Washington, D.C. Ralph Bradford, Secretary, 1615 High St., N.W., Washington, D.C.

30–May 2, Personnel and Industrial Relations Institute on "What's New in Personnel and Industrial Relations," Purdue University, Lafayette, Ind. J. E. Walters, Personnel Service, Executive Building, Purdue University, Lafayette, Ind.

MAY

1–3, American Society of Mechanical Engineers, Spring Meeting, Worcester, Mass. C. E. Davies, Secretary, 29 West 39th St., New York.

6–10, American Foundrymen's Association, Inc., 1940 Convention and Exhibition, Chicago. C. E. Hoyt, Executive Vice-President, 222 West Adams St., Chicago.

6–10, National Fire Protection Association, Annual Meeting, Atlantic City. Percy Bugbee, General Manager, 60 Batterymarch St., Boston.

21–24, Smoke Prevention Association, Annual Convention, St. Louis. Headquarters Office, City Hall Square Building, Chicago.

JUNE

24–27, National Association of Cost Accountants, Annual Meeting, St. Louis. S. C. McLeod, Secretary, 385 Madison Ave., New York.

24–28, American Society for Testing Materials, Annual Meeting, Atlantic City. C. L. Warwick, Secretary, 260 South Broad St., Philadelphia.

JULY

24–27, Silver Bay Conference on Industrial Relations, Twenty-third Annual Conference. Silver Bay-on-Lake George, N. Y. E. H. T. Foster, Executive Secretary, 347 Madison Ave., New York.

UNIVERSITY SUMMER COURSES FOR EXECUTIVES AND ENGINEERS

June 10–28, Summer Management Course devoted to Motion and Time Study, University of Iowa. Ralph M. Barnes, College of Engineering, University of Iowa, Iowa City.

June 17–September 7, Summer Graduate Institute in Engineering and Science, Armour Institute of Technology. June 17–July 13, Manufacturing Standards; July 15–August 10, Motion and Time Study; August 12–September 7, Standards in Personnel Procedure. Dr. L. E. Grinter, Vice-President and Dean of the Graduate Division, Armour Institute of Technology, Chicago.

September 4–14, Second Annual Course in Statistical Methods for Industrial Experiments and Quality Control. Massachusetts Institute of Technology. H. A. Freeman, Department of Economics, Massachusetts Institute of Technology, Cambridge, Mass.

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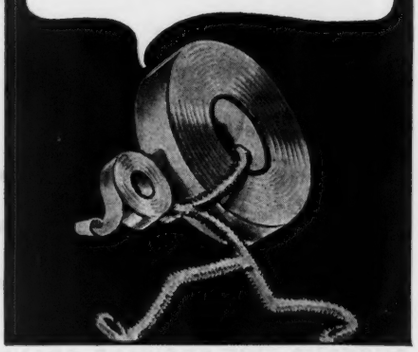

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